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Program Report

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MMS 87-0003

Geological & Geophysical Data Acquisition

Outer Continental Shelf
Through Fiscal Year 1985

MMS

U.S. Department of the Interior
Minerals Management Service
Offshore Resource Evaluation Division

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Geological & Geophysical Data Acquisition

**Outer Continental Shelf
Through Fiscal Year 1985**

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& Patricia Fulton

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PREFACE

The U.S. Department of the Interior (DOI) offered oil and gas leases on 420.6 million acres of the Outer Continental Shelf (OCS) from 1954 through 1985. During this period the Federal Government received more than \$76 billion in revenue from 40.8 million leased acres on the OCS. The Minerals Management Service (MMS) of the DOI issues permits for OCS prelease exploration and scientific research activities; evaluates mineral resources; leases acreage; regulates postlease exploration, development, and production activities; and collects royalties from Federal oil and gas leases on onshore Federal lands and on the OCS.

The MMS acquired 945,078 line miles of common depth point seismic information at a cost of approximately \$70 million from fiscal year 1968 through 1985. During the period 1960 through 1985, the MMS issued 8,670 permits for geological and geophysical (G&G) data acquisition, 6,864 of which were in the Gulf of Mexico OCS.

This report focuses on the G&G data acquisition and permitting activities of the MMS Resource Evaluation Program which is described in detail in OCS Report MMS 85-0091 (Dellagiarino, 1986). This report also provides the reader with an understanding of the OCS permitting process; the kinds and amounts of G&G data and information that the MMS has acquired; MMS data coverage on the OCS; and uses by the MMS of the data and information.

ACRONYMS

BLM -	Bureau of Land Management
CDP -	Common depth point
CFR -	Code of Federal Regulations
COST -	Continental Offshore Stratigraphic Test
CFY -	Current fiscal year
DOI -	Department of the Interior
FY -	Fiscal year
G&G -	Geological and geophysical
GOM -	Gulf of Mexico
HR -	High-resolution
MMB -	Minerals Management Board
MMS -	Minerals Management Service
OCS -	Outer Continental Shelf
OCSLAA -	Outer Continental Shelf Lands Act Amendments
ORED -	Offshore Resource Evaluation Division
REP -	Resource Evaluation Program
SEG -	Society of Exploration Geophysicists
USGS -	U.S. Geological Survey

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Formation of the Minerals Management Service

As a means of developing the mineral resources of the Outer Continental Shelf (OCS), the United States Congress established a leasing and regulatory program within the Department of the Interior (DOI). The Secretary of the Interior was designated by the OCS Lands Act of 1953 to manage and regulate activities related to the leasing, exploration, development, and production of the OCS mineral resources.

On January 19, 1982, the Secretary of the Interior issued Secretarial Order No. 3071 establishing a Minerals Management Board (MMB), chaired by the Under Secretary of the Interior, and the Minerals Management Service (MMS) which was formed by the transfer of the functions being performed by the Conservation Division of the U.S. Geological Survey (USGS). The newly created MMS was supervised directly by the MMB.

Secretarial Order 3071 was amended on May 10, 1982, to consolidate all offshore leasing and resource management functions for the OCS within the MMS. The significant growth in DOI's program since the Arab oil embargo of 1973 had been accompanied by a division of OCS activities among several Bureaus and organizations. These activities were consolidated 1) to provide greater management oversight and accountability for the collection of royalties and bonuses and 2) to assure that the Federal Government received fair market value for leases issued by the DOI.

Under the consolidation, the MMS assumed all DOI functions in direct support of the OCS program, including: all functions of the Office of OCS Program Coordination; all functions related to the management of offshore energy and minerals administered by the Bureau of Land Management (BLM); all functions in direct support of the OCS program in the Geologic Division and the Office of the Assistant Director for Resource Programs, as well as the oil-spill trajectory analysis functions of the Office of Earth Sciences Applications, USGS; and all functions relating to the OCS program of the Department of Energy.

On December 3, 1982, Secretarial Order No. 3087 consolidated onshore minerals management functions within the BLM; consolidated onshore and offshore minerals leasing revenue management functions within the MMS; abolished the MMB; and assigned the MMS to the Assistant Secretary for Energy and Minerals. The Secretary subsequently reassigned the MMS to the Assistant Secretary for Land and Minerals Management.

The MMS maintains regional offices for the Alaska OCS, the Atlantic OCS, the Gulf of Mexico OCS, and the Pacific OCS, and an office for strategic and international minerals.

Responsibilities of the MMS

The MMS has the major responsibility for administering the DOI's role in activities associated with mineral resource development on the Federal OCS. These activities relate to

the assessment, leasing, exploration, development, production, and royalty management of these mineral resources. The responsibilities of the OCS leasing program include 1) performing environmental assessments to ensure compliance with the OCS Lands Act, National Environmental Policy Act, National Marine Mammals Act, Clean Water Act, Clean Air Act, etc.; 2) selecting and evaluating tracts offered for lease by competitive bidding; 3) conducting lease offerings and assuring that the Federal Government receives fair market value for lands leased; and 4) regulating and supervising exploration, development, and production operations on OCS lands.

This report describes the general role of the MMS Resource Evaluation Program (REP) in the OCS leasing program and addresses in detail geological and geophysical (G&G) data acquisition and permitting activities. Included is a brief description of the uses of G&G data in the REP. The program's historical background is provided, as well as the evolution of associated regulations. The appendix of the report contains a statistical summary of permitting activities from 1960 through 1985 and G&G data acquisition efforts from FY 1968 through 1985.

Regulatory Authority

The MMS administers the provisions of the OCS Lands Act through regulations found at Title 30 of the Code of Federal Regulations (CFR). The regulations govern permitting, data collection and release, leasing, and postlease operations on the OCS.

With regard to the REP, authority has been vested in the Secretary of the Interior under 30 CFR Part 251 to regulate prelease G&G exploration for mineral resources on the OCS. Part 251 applies not only to G&G exploration but to scientific research as well. The purpose of these regulations is to prescribe 1) when a permit or the filing of a notice is required to conduct G&G exploration on the OCS and 2) operating procedures for conducting exploration, as well as requirements for disclosing data and information, conditions for reimbursing permittees for certain costs, and other conditions under which exploration shall be conducted.

ROLE OF THE RESOURCE EVALUATION PROGRAM IN THE OCS LEASING PROCESS

The Resource Evaluation Program (REP) of the MMS is responsible for investigating the mineral potential of the OCS, predominantly oil and gas, and for assuring the receipt of fair market value for oil and gas leases on the OCS. The primary objectives of the REP are to

- ° Provide sound analytical and technical support to the OCS leasing process, including postlease regulatory activities, so that all activities can be performed effectively and efficiently.
- ° Provide scientific data and information on the OCS to assure an adequate data base is available to the Secretary in support of leasing decisions.

- ° Provide regional and site-specific subsurface structure maps of the OCS.
- ° Provide resource estimates, exploration and development scenarios, and economic parameters and statistical data on lease sale areas.
- ° Provide resource economic evaluations and bid adequacy determinations for tracts bid upon in lease sales to assure that the Government receives fair market value for leased lands.

Resource Evaluation Program G&G Data

The petroleum industry gathers a massive amount of data under prelease geological and geophysical (G&G) permits and post-lease drilling permits (obtained from the MMS) in their search for oil and gas. Such diverse disciplines as geology, geophysics, petrophysics, micropaleontology, geochemistry, reservoir engineering, well log prospecting, and mathematical modeling all play a part in industry's multidiscipline approach to prospecting for petroleum. In order for the REP to perform the above objectives, the MMS obtains some of these data from industry.

Geophysical exploration data provide the majority of the information for prelease prospect selection and resource estimation by both industry and MMS. Reflection seismology, utilizing digital data recording and processing techniques, is the basis for most of the prelease exploration judgments on the potential location and amounts of oil and gas beneath the OCS.

Exploration geophysics is a young, hybrid science developed during the last 60 years to aid the geologist. Geophysical methods include measurements of the earth's magnetic, gravitation, and electrical fields; however, seismic recording of propagating elastic waves constitutes the principal method for mapping geologic structures that may contain hydrocarbon deposits, accounting for more than 94 percent of all expenditures in geophysical activity (cf., Oil and Gas J., September 14, 1981). Modern exploration seismology uses advanced technology from many diverse fields such as communications engineering, electronics, information retrieval, telemetry, optics, and acoustics (Wood, 1982, p. 45).

Figure 1 depicts a marine geophysical survey. An array of acoustic sources (sound wave generators) are towed at a controlled depth to generate a seismic signal. A streamer consisting of a cable and arrays of pressure sensitive hydrophones grouped along the cable is used for detecting the

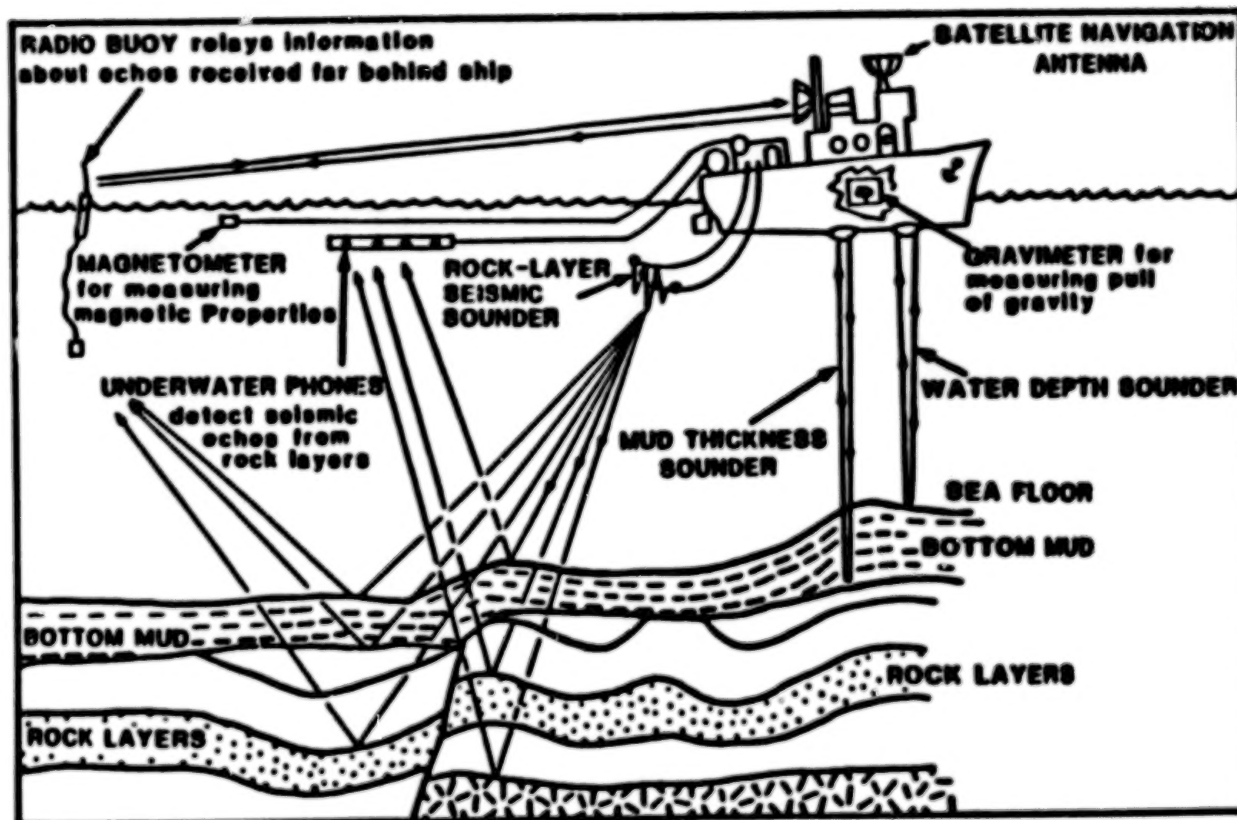
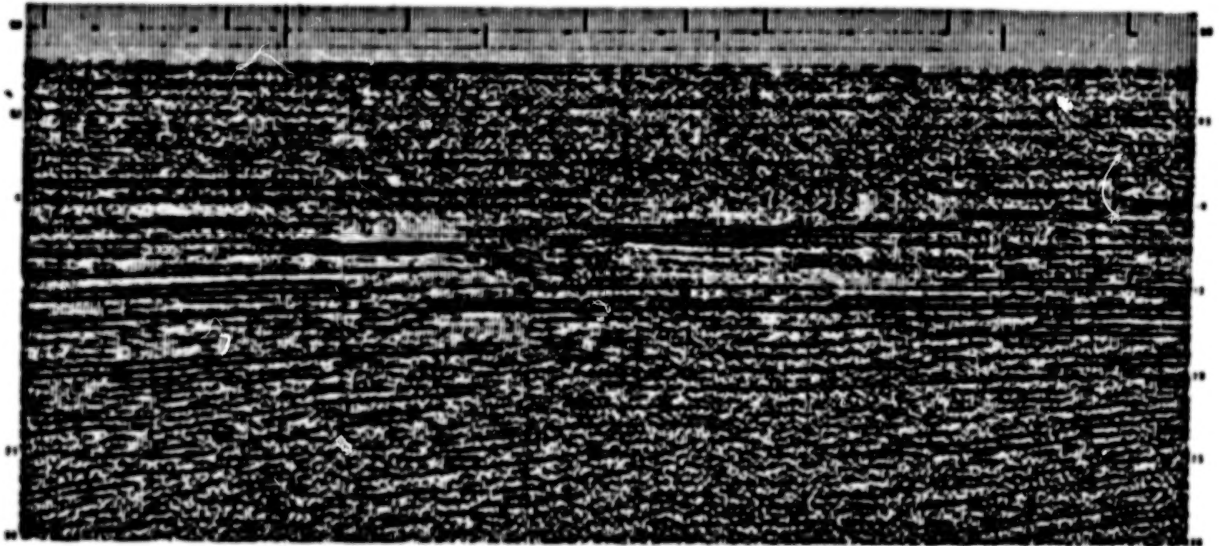


Figure 1.--Schematic showing marine seismic prospecting method

reflected seismic signals. The hydrophone streamer is typically 2 to 3 miles in length. Other geophysical systems depicted are a towed magnetometer, two types of echo sounders mounted on the ship's hull, and a gravimeter mounted amidships. Only the seismic reflection system is described in this report, as seismic data are the data most extensively used in identifying prospects.

In a seismic survey, acoustic waves generated by an energy source are reflected off the sea floor and at varying depths below the sea floor back toward the sea surface where they are detected by the hydrophones. The resulting signals are transmitted through the cable to the survey ship for recording and field processing. Seismic profiles of the subbottom are produced by measuring the total travel time of the seismic waves and applying mathematical corrections. A typical seismic profile of recorded signals, showing reflections at depth along the line surveyed, is shown in figure 2.



Multifold seismic reflection data (standard processing). Courtesy of Teledyne Corporation.

Figure 2.--Multifold seismic reflection data

Seismic profiles provide a cross-section of the subsurface revealing structural details such as faults, folds, anticlines, (salt domes,) and synclines (see figures 3 and 4 for some examples). In some cases compositional information such as porosity, permeability, water saturation, and hydrocarbon content can also be predicted. Presently, seismic data provide the most reliable means of acquiring subsurface structural and stratigraphic information without drilling wells (Wood, 1982, p. 45).

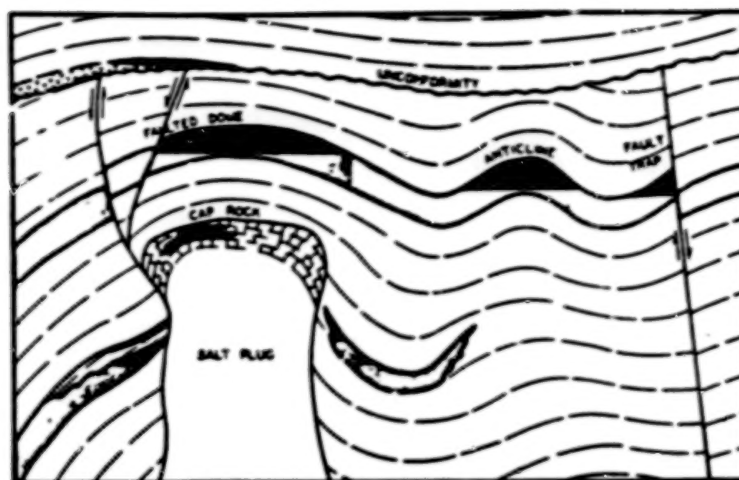


Figure 3.--Common types of structural traps



Figure 4.--Common types of stratigraphic traps

Geological data and information are obtained by various methods. Common techniques used before drilling a deep well include dredge and bottom grab sampling, coring, and shallow stratigraphic (less than 300 feet) borings. Figure 5 depicts some of the tools used for these methods. Geological data are also obtained from drilling exploration, development, and production wells on a lease. Data and information gathered during these operations include electrical, radioactive, and electromagnetic data; engineering logs; geochemical and paleontological determinations of cores; and well cuttings. Geophysical data and information are also obtained from deep drilling, for example, check shot surveys and vertical seismic profiles which involve seismic recording in a well of acoustic signals generated outside the well.

The combined use of geology and seismology greatly reduces the risks involved in oil and gas exploration. (The increase in) the success rate of new-field wildcats in the United States . . . correlates directly with major advances in seismic technology . . . (and underscores) the importance of improved geophysical methods (Wood, 1982, p.45).

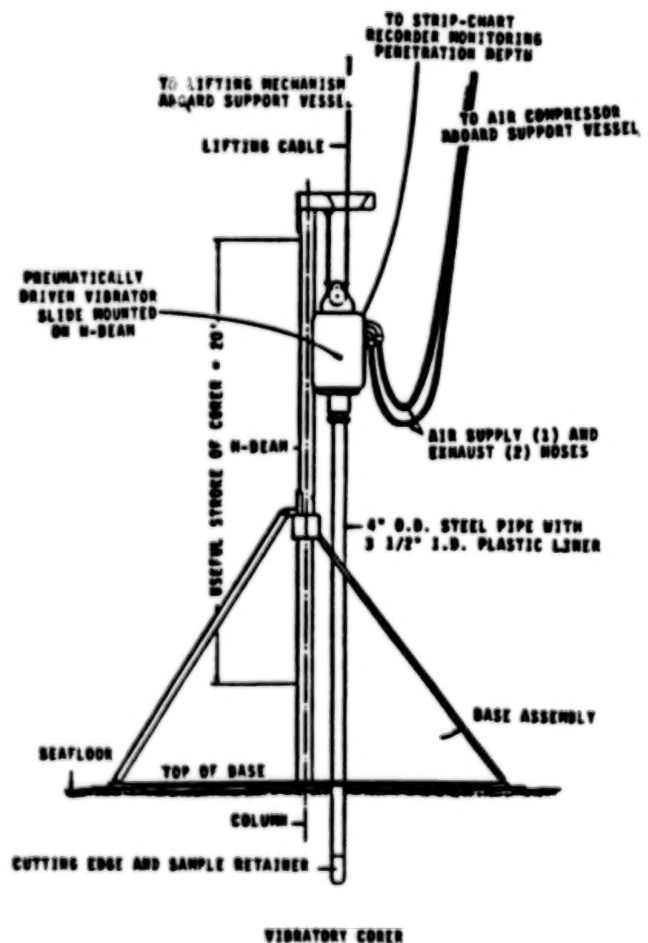
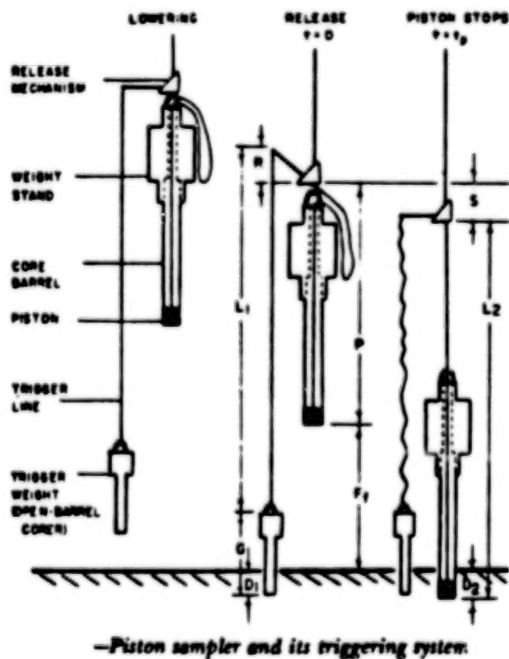
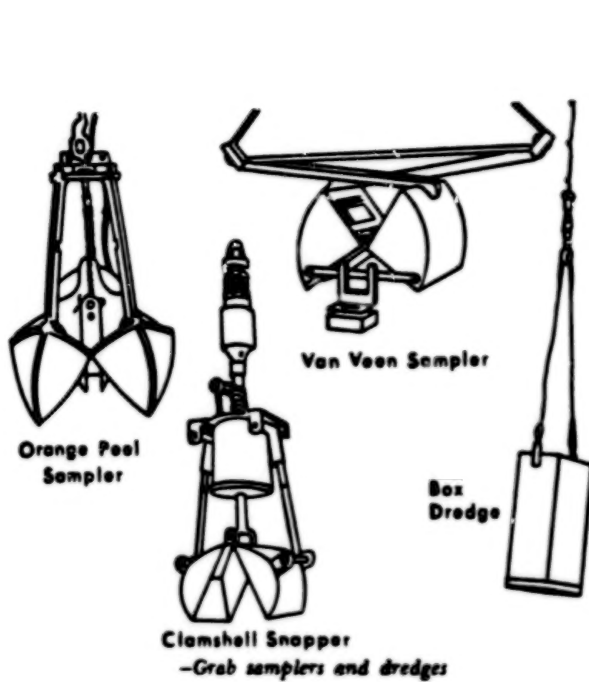


Figure 5.--Marine geological sampling tools

The REP consists of two interrelated activities: (1) G&G Data Acquisition, Evaluations and Analyses to interpret the data and (2) Resource Economic and Engineering Evaluations and Analyses which utilizes these interpretations.

G&G Data Acquisition, Evaluations, and Analyses

This activity provides information throughout the leasing process and uses G&G data to identify and evaluate areas and tracts having potential for oil, gas, and strategic/critical mineral resources. In the early stages of the leasing process, the G&G Data Acquisition activity focuses on gathering scientific data and other information, compiling subsurface geologic maps, and conducting evaluations and analyses required for making decisions concerning the entire planning areas being considered for lease. As the leasing process progresses, the focus changes from planning areas to the specific area being offered for lease and the potential prospects within that area. Upon completion of the evaluations used to determine bid acceptance or rejection, the emphasis shifts again to the planning area for future lease sales. Prospect-specific maps and analyses are updated from new information, when appropriate, for future lease sales. The areawide mapping and analyses also identify prospective areas that are used in reviewing and developing lease schedules for oil, gas, and strategic/critical minerals.

The major functions of the G&G Data Acquisition, Evaluation, and Analyses activity are data acquisition, production and analyses of areawide maps, and production and analyses of tract- and prospect-specific maps for resource economic evaluations. These functions are essential for completing major milestones in the leasing and evaluation process.

Industry collects G&G data in compliance with permits and leases issued by the MMS. The MMS, in turn, selectively acquires these data pursuant to permit or lease terms and regulations to directly support the evaluations and analyses required throughout the leasing process. These data include well logs, other data from wells, and significant amounts of common depth point (CDP) seismic data. Areawide maps and analyses are the basis for a geology report and area of hydrocarbon potential determination used in the early stages of the leasing process and later for the Resource Economic and Engineering Evaluations and Analyses activities.

The primary objective for producing areawide maps and analyses is to provide preliminary reconnaissance of the planning area in preparation for lease sales. Technical and scientific data and information are analyzed to develop a basic knowledge of the geologic history, including the effects of generation, distribution, and accumulation of hydrocarbon and strategic/critical minerals within the planning area. This knowledge provides the basis for geology reports, resource estimates, and associated maps that describe the geology, probability of hydrocarbon occurrence, resource potential, and potential shallow geologic hazards of the planning area.

After area prospect identification, the emphasis shifts to more detailed mapping and analyses needed to estimate the resource potential of individual prospects within the area offered for lease. These prospect-specific data, maps, and analyses are also used to determine parameters for postsale bid analyses.

After completing the evaluations and analyses for a specific lease sale, the prospect-specific analyses are incorporated into the regional maps and analyses and the process is repeated for the next sale.

Resource Economic and Engineering Evaluations and Analyses

Concurrently with the G&G Data Acquisition, Evaluations, and Analyses activity, the Resource Economic and Engineering Evaluations and Analyses activity provides related, but entirely different, technical and analytical data for the lease sale process. The objectives of this activity are 1) to estimate the technologically and economically recoverable energy and strategic/critical mineral resources of the OCS for planning areas and potential lease sales; 2) to analyze, develop, and design economic and engineering parameters on a lease sale and tract-specific basis for assessing environmental impact and determining bid adequacy; and 3) to conduct cost-benefit studies of leasing alternatives. Fundamental to accomplishing these objectives are the design, maintenance, and update of advanced computer models, data processing systems, and data bases for economic and engineering evaluations and analyses essential for the overall OCS leasing program and for policy decisionmaking.

This activity combines much of the data and information derived from the G&G Data Acquisition, Evaluations, and Analyses activity with economic and engineering analyses to develop products that are essential to completing major steps in the leasing process. These products include an exploration and development report, information for the acceptance or rejection of high bids, and the input to the annual review of the 5-year OCS Oil and Gas Leasing Program (5-Year Leasing Program), as required by the OCS Lands Act. Additionally, this activity provides comprehensive information on the availability of undiscovered offshore oil and gas resources essential to the national security of the United States. The flow diagram depicted in figure 6 illustrates the REP, including the relationships among G&G data acquisition, analyses, and interpretative products used in resources and economic modeling.

Other Activities of the REP

Section 8(g) of the OCS Lands Act Amendments of 1978 and 1985 (OCSLAA) requires that Governors of States adjacent to proposed leasing areas be provided with information describing the area at the time of the Call for Information and Nominations. The Resource Evaluation Program is responsible for providing information on the G&G characteristics of the area or region to the Governor of the affected State.

GEOPHYSICAL PROCESSES

GEOLOGIC PROCESSES

INPUTS TO MODELS

COMPUTER MODELS

RE PRODUCTS

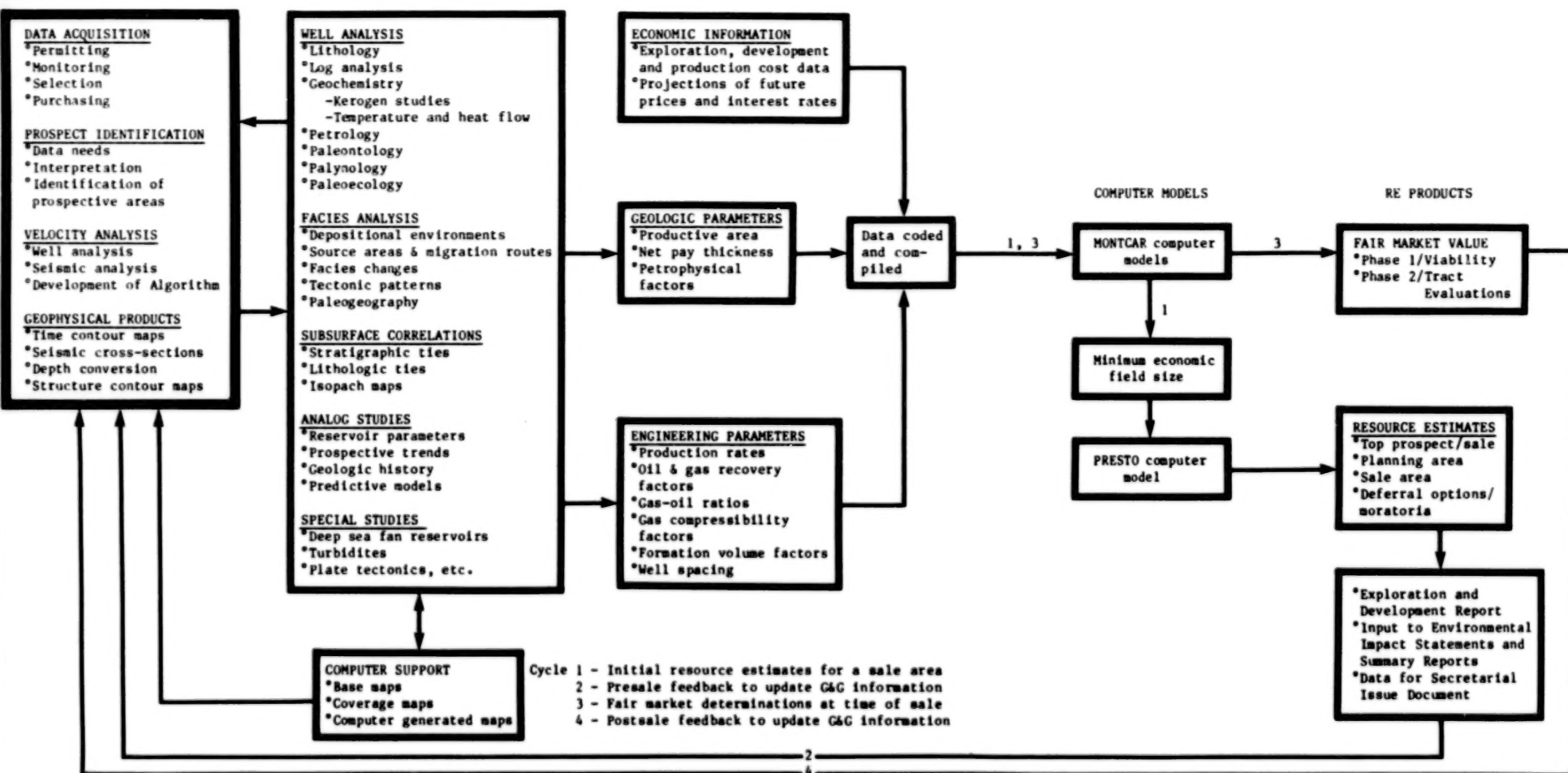


Figure 6.--Flow diagram of the Resource Evaluation Program

To satisfy the requirements of section 8(g) of the OCSLAA and defend lawsuits in disputes between the Federal Government and States, it is frequently necessary for MMS to purchase CDP seismic reflection data in State waters that are acquired under State permits. The acquisition costs of these data are usually much more expensive than permit data from Federal waters as MMS is required to pay the commercial price.

BACKGROUND AND HISTORY OF THE REP

Background

In broad terms, the objective of acquiring and analyzing G&G data is to identify areas and tracts that have potential for the occurrence of oil, gas, and strategic/critical minerals. The data acquired form the basis for mapping and evaluating the formation and distribution of potential offshore resources and for assuring receipt of fair market value for lands leased.

Industry collects prelease G&G data in compliance with permits issued through the OCS Resource Evaluation Program. Pursuant to conditions of the permit, the collected data are inspected and selectively acquired by MMS to directly support analyses required throughout the leasing process (see figure 7). In addition to well logs and other data acquired as a condition of a lease, the MMS also acquires prelease data from deep stratigraphic tests and seismic surveys. These data are carefully analyzed and interpreted 1) to map a proposed lease sale area and determine the areas of hydrocarbon potential, 2) to specifically locate and map geologic structures capable of trapping hydrocarbons, and 3) to establish values for the geologic parameters necessary for resource assessment and economic evaluation to support leasing decisions.

Seismic data provide the primary data base for much of the efforts in the area identification and evaluation process (see figure 8). The existing seismic data base in a planning area is not only used as a source of information related to a specific sale, but is supplemented with new or additional data and used for later sales in the same planning area.

Historical Setting, 1954-1975

The first OCS oil and gas lease sale was held in the Gulf of Mexico (GOM) in October 1954. By 1963, seven OCS general sales and two drainage sales had been held in the GOM. The first OCS sale outside the GOM was held offshore California in May 1963, followed by an OCS sale offshore Washington and Oregon in October 1964. Over the next 12 years, only three sales were held offshore California and only one in the Eastern GOM. Consequently, the Texas/Louisiana areas in the GOM were the focus of industry's early interest. A major effort to move into frontier areas did not begin until 1976.

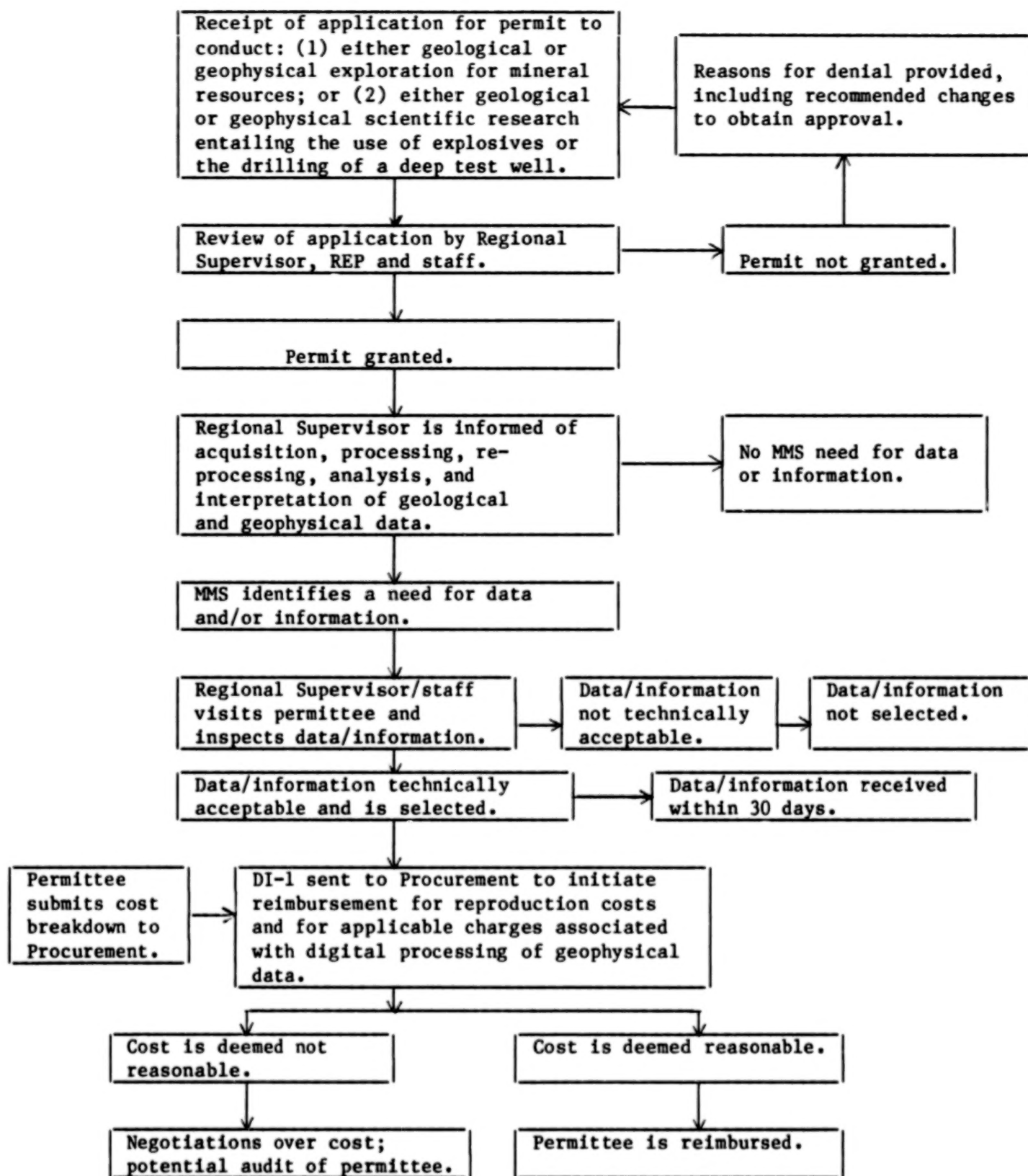


Figure 7.--MMS acquisition of geological and geophysical data and information as a condition of permit and regulations

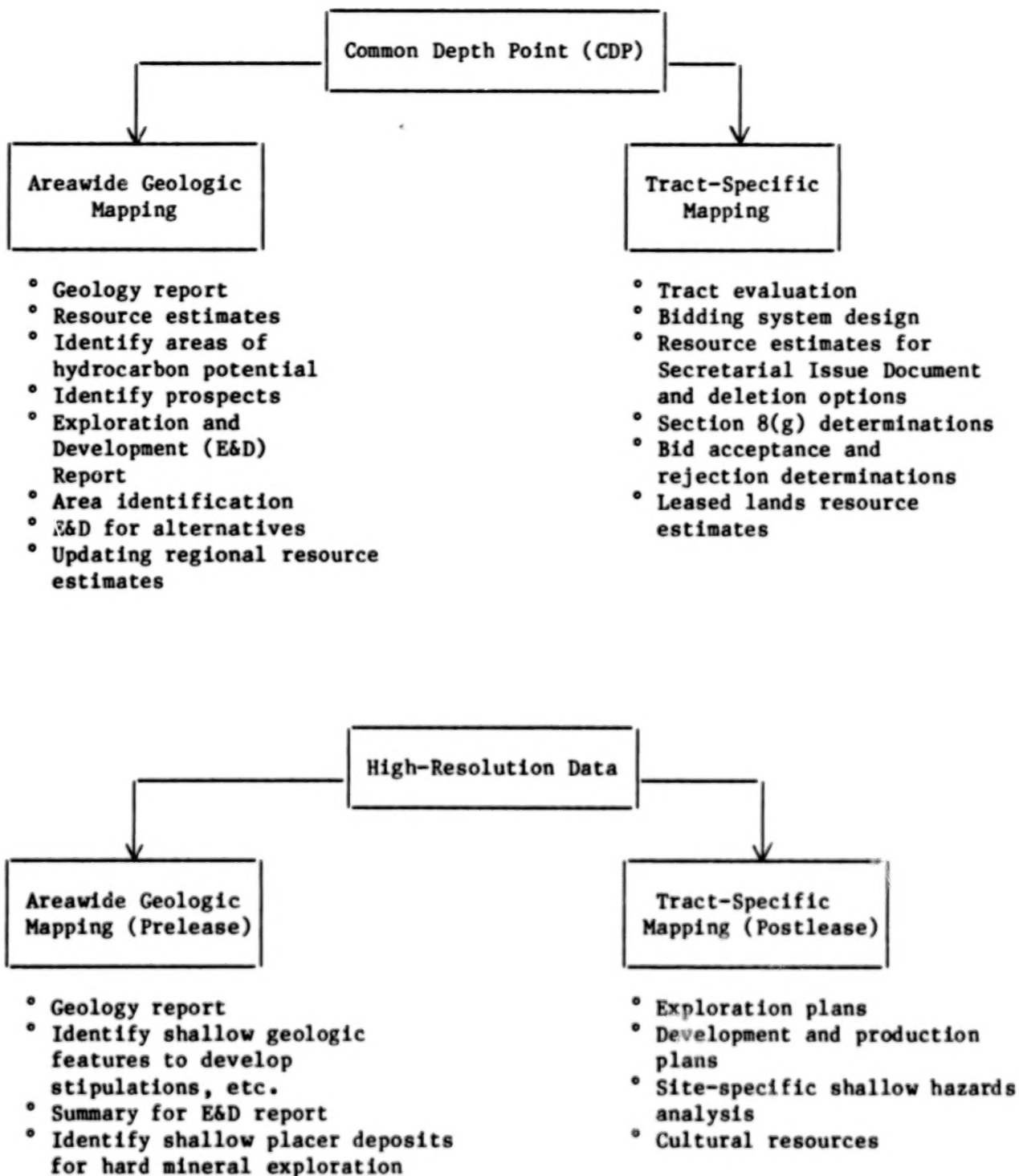


Figure 8.--MMS uses for marine seismic data

In the early 1960's, the OCS Resource Evaluation Program was established to address concerns relating to the Government's ability to

- ° Assure receipt of fair market value, and
- ° Assess technically the hydrocarbon potential of tracts nominated for lease to lessen industry's masking of their true areas of interest.

In 1968, G&G data acquisition started with funding for data collected by the U.S. Geological Survey (USGS) and Texas A&M University. By fiscal year (FY) 1970, G&G data needed to perform resource evaluation functions were primarily acquired through nonexclusive contracts with industry.

At that time, the single-value method was used for evaluating tracts. This method involved gathering G&G, economic, and engineering data for each tract and determining the best estimate of the value for each variable that affected profitability. A discounted cash-flow analysis was then performed and a net present value calculated.

In the early 1970's, the single-value method was replaced with the Monte Carlo or range-of-values technique for handling uncertainty. This new method used subjective assessments of probability distributions or ranges of values for geological, economic, and engineering parameters affecting tract value.

During this period, the need to acquire data to assess shallow hazards was emphasized as a result of 1) the Santa Barbara Channel blowout that was associated with shallow faulting and 2) several platform failures in the GOM caused by sediment movement. To address these concerns, the Government began purchasing prelease, high-resolution seismic data. By 1974, contracting for exclusive high-resolution data by the Government was required as no speculative data were available from industry. In 1976, this effort was significantly expanded to meet a policy requiring that tracts with shallow hazards be withdrawn before a sale or that stipulations be added to the leases on these tracts to overcome engineering constraints caused by shallow hazards. These data were acquired at a high cost that increased significantly as the number of tracts offered for lease increased and as sales were scheduled in the Alaskan OCS, a high cost area for the acquisition of exclusive seismic data.

In response to the 1974 energy crisis, a policy to increase the amount of OCS acreage significantly was announced. This policy necessitated a major effort to staff regional offices fully and to increase data collection in frontier areas. Thus in 1975, total G&G data acquisition expenditures reached \$14.9 million. As a result, the required fiscal year funding level for resource evaluation efforts reflected a major program initiative.

Historical Setting, 1976-1985

There were two major developments during the late 1970's which prompted policy changes in the REP. The first was the clear indication of a continual increase in G&G data acquisition expenditures. The second was the OCSLAA of 1978, which clarified the authority of the Secretary of the Interior to cancel leases and compensate lessees if, in the process of post-lease exploration, hazards were identified that would preclude drilling and development. As a result, policy was modified in 1980 allowing acquisition of prelease shallow hazards data only on those tracts where professional judgment indicated such data were needed. Because of high costs, however, this policy was amended in 1982 to eliminate the acquisition of prelease, tract-specific hazards data.

Starting with Sale 76 (Mid-Atlantic Lease Offering, April 1983), the MMS no longer conducted prelease, tract-specific, shallow hazards data acquisition and analysis. Shallow hazards data acquisition and analysis are currently performed by relying on data previously acquired and data required of the lessees in support of applications for permit to drill and plans for exploration and development or production.

Another major policy change affecting resource evaluation efforts was that of areawide leasing. This streamlining concept began in 1983 with Sale 76. Areawide leasing requires data in sufficient detail 1) to map entire planning areas during prelease and 2) to evaluate, during postlease, those tracts where competition is judged inadequate to assure receiving fair market value. Thus, while areawide leasing does not require large expenditures for hazards data, it does require an increase in CDP seismic data.

PERMITTING REGULATIONS AND PROCEDURES

The requirement to obtain a permit for acquiring G&G data has been challenged by industry many times in the past. However, careful interpretation of the OCS Lands Act and the intent of Congress eliminates any doubt that such permitting is both authorized and required. Section 11 of the OCS Lands Act provides for prelease G&G activities.

Any agency of the United States and any person authorized by the Secretary may conduct geological and geophysical explorations in the Outer Continental Shelf, which do not interfere with or endanger actual operations under any lease maintained or granted pursuant to this Act, and which are not unduly harmful to aquatic life in such area.
[Emphasis added.]

Therefore, only such activities authorized by the Secretary may be conducted on the OCS. Permits have in fact been used for authorization since the enactment of the OCS Lands Act in 1953.

The 1978 amendments to the Act added subsection (g) to section 11 authorizing the Secretary to issue regulations for permitted activities. The regulations at 30 CFR Part 251 govern the prelease activities pursuant to the OCS Lands Act. Section 251.14-1 requires a permit for prelease exploration activities. It provides in part:

Geological or geophysical exploration for mineral resources may not be conducted on the OCS without an approved permit unless such activities are being conducted pursuant to a lease issued or maintained under the Act.

As shown in figure 7, p. 12, the procedure for processing and approving OCS exploration permits includes

- ° Review of application for permit to conduct OCS exploration for mineral resources or scientific research,
- ° Issuance of permit including terms, conditions, and stipulations,
- ° Timely correspondence with each permittee, and
- ° Monitoring permit activity.

REIMBURSEMENT REGULATIONS AND PROCEDURES

Before 1976, CDP seismic data were primarily acquired by the Government through nonexclusive contracts or as a cost-sharing participant in group shoots. At that time the concept of obtaining the data as a condition of permit was considered. The requirements for submission of permit data collected and the conditions for reimbursement for certain costs incurred by permittees or a third party for submitted data were addressed when 30 CFR Part 251 was published in June 1976. Section 251.13 provides reimbursement to permittees for

- ° Reproduction costs for submitted geophysical data, processed geophysical information, and reprocessed geophysical information at the permittee's lowest rate or at the lowest commercial rate in the area, whichever is less, and
- ° Processing and reprocessing costs only, as distinguished from the cost of data acquisition. The amount of reimbursement was not to exceed the lowest rate available to any purchaser or to be more than one-half of the processing or reprocessing cost incurred if the information was not available for sale and the permittee or third party was the only participant.

The Appropriations Act for FY 1986 (Public Law 99-190) provides that when in FY 1986 and thereafter any permittee provides data and information to the Secretary pursuant to section 1352(a)(1)(c)(iii) of Title 43, United States Code, the Secretary shall pay only the reasonable cost of reproducing such data and information.

At the beginning of each fiscal year, proposed acquisitions of G&G data are assigned priorities and approved by the Director, Minerals Management Service. Expenditures are continuously monitored by headquarters throughout the year and reassessed as required by changes in data needs and in the 5-Year Leasing Program. A statistical summary of expenditures for FY 1968 through FY 1985 and a comparison of industry and MMS costs are provided in tables 2A through 12A of the appendix.

CURRENT PROCEDURES OF THE GEOPHYSICAL DATA ACQUISITION PROCESS

Before the beginning of each fiscal year, set procedures are followed to determine regional data needs for the following fiscal year. These procedures are summarized as follows.

- ° Each Regional Director assesses that Region's G&G data needs, establishes a priority for those needs, and forwards the list to headquarters.
- ° Data priorities are determined by the need to meet the Secretary's 5-year Leasing Program and to support litigation and, to a limited extent, by the data needs relative to boundary disputes and regional resource assessments.
- ° A meeting is held at which senior representatives from each Region and headquarters, with in-depth knowledge of the data acquisition program, combine the individual priority lists into a single MMS priority list. This meeting provides the opportunity for peer review.
- ° The MMS priority list is presented to the Director, Minerals Management Service for review and approval, allocation of funds among Regions, and authority to reimburse permittee for data within the total allocation of funds established for G&G data acquisition.
- ° All G&G data acquisitions are continuously monitored throughout the fiscal year by the Offshore Resource Evaluation Division (ORED), and a monthly status report of commitments and funds obligated is submitted to the Associate Director for Offshore Minerals Management. Near the end of the fiscal year, these reports are prepared on a more frequent basis.

After approval of the G&G data acquisition priority list, the Regions proceed to acquire data within the limits of their funding allocation. The procedures for acquiring data from permittees are as follows.

- ° The Regions are notified by permittees when data become available. If the data are of interest to a Region, the Region arranges an inspection, usually on the permittee's premises, to assess the data's quality and location. After the inspection, the Region notifies the permittee in writing of the data selected; delivery of data to the Region is required within 30 days. Once received, the data are immediately incorporated into the Region's data base and interpretation commences.

- ° After the Region receives the selected data, the permittee submits a request for reimbursement. If the MMS determines that the requested reimbursement is proper, the permittee is reimbursed for the reasonable costs attributable to reproduction and processing or reprocessing, as distinguished from the cost of data acquisition. The processing or reprocessing cost is determined as follows: (1) for data acquired under permits issued before October 1, 1985, and if the processing or reprocessing has been done by the permittee in the form and manner which is used in the permittee's normal conduct of business, the MMS pays the reasonable cost at the lowest rate at which the processed or reprocessed data are made available by the permittee to any party; (2) if the processing or reprocessing has been done in a form and manner as the MMS may request other than that used in the normal conduct of the permittee's business, the MMS pays the costs of processing or reprocessing such data.
- ° The language of Title 30 CFR Part 251 states that once data are selected and retained by MMS, a request for reimbursement is submitted, and the requested reimbursement is deemed proper, the permittee shall be reimbursed.
- ° When the Regional Director selects data in writing from a permittee, a copy of the letter selecting the data and a requisition are forwarded to the appropriate MMS Administrative Service Center. Contracting personnel at the Administrative Service Center assure that the price of the data does not include acquisition costs and is the lowest rate available to any other purchaser. The Service Center then issues a contract or purchase order which authorizes reimbursement.

BUDGET PROJECTIONS FOR G&G DATA ACQUISITION

The Offshore Resource Evaluation Division (ORED) uses certain criteria to estimate future fiscal year budgets for G&G data acquisition. The most important of these future years is the current-fiscal-year (CFY) plus-2-year (CFY + 2) budget projection for the G&G data acquisition. The primary criterion is the 5-Year OCS Oil and Gas Leasing Schedule (5-Year Leasing Schedule). The current proposed final schedule is shown in figure 9. Other criteria include the need to develop areawide resource estimates, to map the regional geology, and to acquire information to answer inquiries concerning other nonsale-related activities such as international boundary disputes.

Each year the ORED estimates G&G data and budget needs for the next 5 years and separately for CFY + 2 after consulting with each Region. These needs are based on

- ° The planning areas that are on the 5-Year Leasing Schedule,
- ° Areas of hydrocarbon potential,
- ° Projected areas of interest by industry,
- ° Quality of in-house G&G data and information;

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**U.S. DEPARTMENT OF THE INTERIOR
PROPOSED FINAL
5-YEAR OCS OIL AND GAS LEASING PROGRAM**

APRIL 1987

SALE	SALE DATE	1987 AMJJASOND	1988 JFMAMJJASOND	1989 JFMAMJJASOND	1990 JFMAMJJASOND	1991 JFMAMJJASOND	1992 JFMAMJ
112 W. GULF OF MEXICO	8/87	G NS					
97 BEAUFORT SEA	1/88	F P G N	S				
113 C. GULF OF MEXICO	3/88	EH	FP	GNS			
109 CHUKCHI SEA	5/88	H	F P	G NS			
115 W. GULF OF MEXICO	8/88	EH	F	P G NS			
107 NAVARIN BASIN	10/88		E H	FP G NS			
116 E. GULF OF MEXICO	11/88	EH	F	P G NS			
91 N. CALIFORNIA	2/89		EH	F P G	NS		
96 N. ATLANTIC	2/89	A		EH FP G	NS		
118 C. GULF OF MEXICO	3/89	CD A		EH FP G	N S		
122 W. GULF OF MEXICO	8/89	CD A		EH F	P G N S		
95 S. CALIFORNIA	9/89		CD A	EH	F P G NS		
SU1 SUPPLEMENTAL	9/89				D IP GNS		
*121 MID-ATLANTIC	10/89	R	CD A	EH	F P G NS		
*120 NORTON BASIN	12/89	R	CD A	E H	FP G NS		
							
*101 ST. GEORGE BASIN	2/90	R	CD	A	EH FP G	NS	
123 C. GULF OF MEXICO	3/90			CD A	EH FP G	N S	
117 N. ALEUTIAN BASIN	5/90			CD A	EH FP	G NS	
125 W. GULF OF MEXICO	8/90			CD A	EH F	P G N S	
*114 GOA/COOK INLET	9/90			R	EH	F P G NS	
SU2 SUPPLEMENTAL	9/90					D IP GNS	
*108 S. ATLANTIC	10/90			R	CD A	F P G NS	
119 C. CALIFORNIA	11/90			CD A	EH	F P G NS	
124 BEAUFORT SEA	2/91			CD A	EH FP G	NS	
131 C. GULF OF MEXICO	3/91			CD A	EH FP G	N S	
126 CHUKCHI SEA	5/91			CD A	EH F	G NS	
135 W. GULF OF MEXICO	8/91			R	CD A	P G N S	
*130 NAVARIN BASIN	9/91					FP G NS	
SU3 SUPPLEMENTAL	9/91					D IP GNS	
137 E. GULF OF MEXICO	11/91			CD A	EH F	P G N S	
*129 SHUMAGIN	1/92			R	CD A	EH FP G N	S
*134 N. ATLANTIC	2/92			R	CD A	EH F P G	NS
128 N. CALIFORNIA	2/92				CD A	EH F P G	NS
139 C. GULF OF MEXICO	3/92				CD A	EH F P	N S
*132 WASHINGTON-OREGON	4/92			R	CD A	EH F	G NS
*133 HOPE BASIN	5/92			R	CD A	EH FP	G NS
138 S. CALIFORNIA	6/92				CD A	EH F	P G NS
*140 STRAITS OF FLORIDA	6/92				R	CD A	P G NS

*Frontier Exploration Sale. Request for Interest will be issued if necessary.

R - Request for Interest C - Call for Information & Nominations D - Comments on Call Due
A - Area Identification E - Draft EIS H - Public Hearing F - Final EIS
I - Issue Environmental Assessment for Supplemental Sale P - Proposed Notice of Sale
G - Governor's Comments Due N - Notice of Sale S - Sale

Figure 9.--Tentative milestones for 5-year oil and gas lease sales through 1992

- ° G&G data anticipated to be acquired between the time of the CFY + 2 projection and the actual occurrence of CFY + 2, and
- ° Existing litigation and anticipated requirements for data in State waters.

The estimated G&G data needs of each Region for CFY + 2 become part of the MMS budget justification submitted to Congress.

CONTINUING REQUIREMENTS FOR ADDITIONAL G&G DATA

The continual acquisition of G&G data and information by industry and the MMS is precipitated by

- ° Nonexistent or inadequate seismic coverage over the planning areas;
- ° The need to enhance or replace old data, which are generally inferior to data obtained with current seismic recording systems (especially the case in mapping deep prospects);
- ° Changes in exploration strategy as a result of initial drilling;
- ° Discoveries in deeper stratigraphic horizons, which often cannot be accurately mapped with old data;
- ° The need to shift exploration efforts to smaller structures once large discoveries in an area have been made (this requires a much more closely spaced grid); and
- ° New techniques in seismic data acquisition such as three-dimensional recording, new filtering, color graphics, more powerful sound sources, quieter seismic arrays, etc.

As a result of the continual data requirement, G&G funding must remain resilient. Recommended levels of funding are carefully scrutinized by each Region and the ORED taking into consideration the above criteria, the level of interest expressed by industry, and both long- and short-term requirements of the 5-Year Leasing Program.

PRESENT MMS DATA COVERAGE IN THE OCS

A leading indicator of the amount of OCS oil and gas activity is the number of prelease exploration permits that MMS issues to industry each year. Figure 10 shows the number of permits issued each fiscal year since 1969 for geological and/or geophysical exploration. The type of geophysical data used most often for petroleum exploration and resource evaluation is CDP seismic reflection data. Industry (petroleum and geophysical companies) shoots and records approximately 500,000 line miles of CDP data each year on the OCS. The MMS selects and acquires approximately 90,000 line miles of these CDP data each year for the REP. Table 1 shows the approximate CDP seismic data coverage by Region and planning area that MMS has in its inventory. The grid coverage is not uniform over the planning areas. The coverage possessed by MMS is shown in figures 11 to 14.

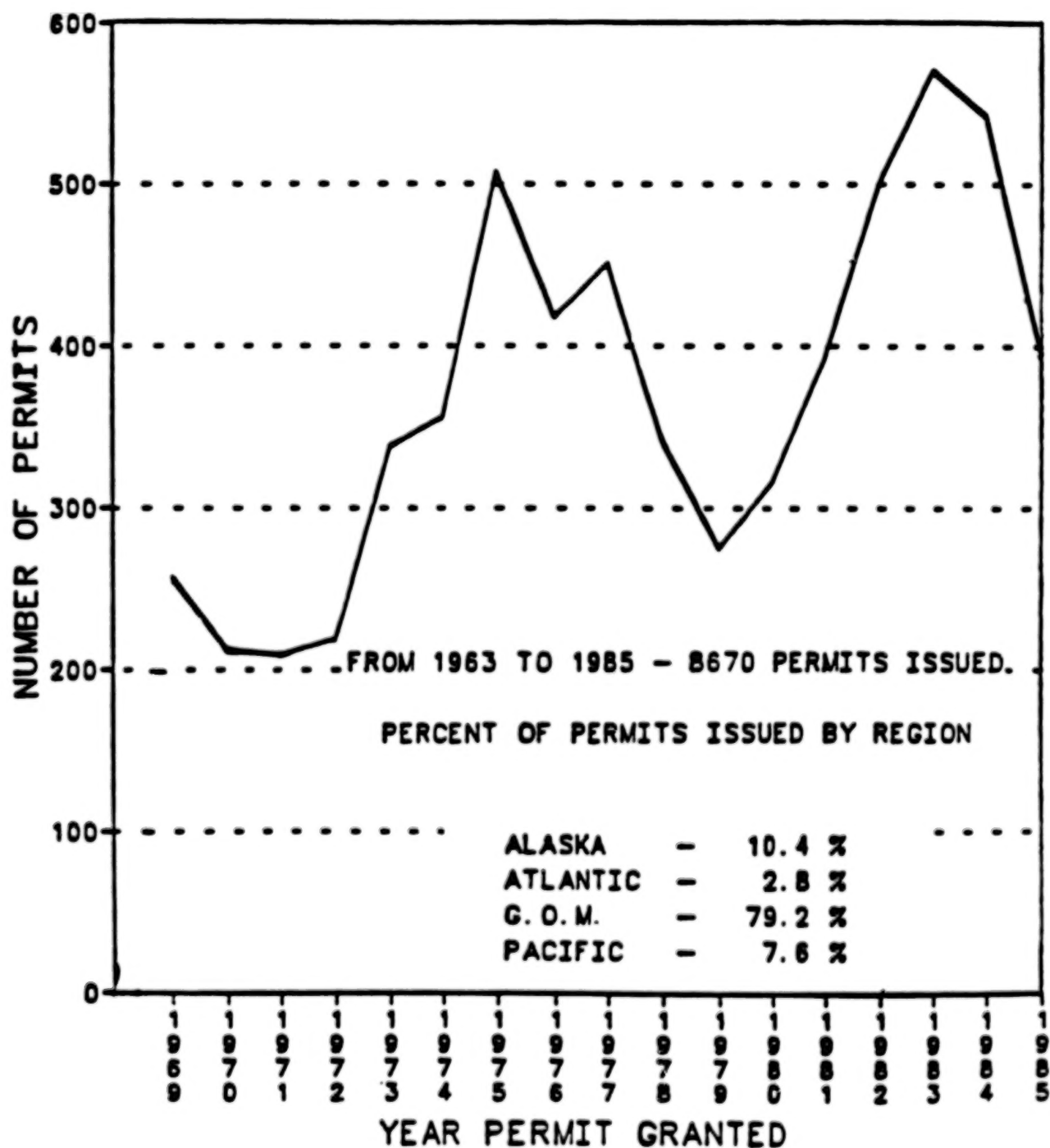


Figure 10.--Number of permits issued for geological and geophysical exploration of the OCS

Table 1.--Summary CDP seismic reflection coverage in MMS inventory

Planning Area	Area in Acres	Estimated CDP Seismic Miles	
		In-House Through FY 1985	Average Grid Space in Miles
ALASKA REGION			
Gulf of Alaska	133,000,000	34,000	1/2 x 1/2 mi. to 15 x 30 mi.
Kodiak	89,000,000	19,000	2 x 2 mi. to 6 x 15 mi.
Cook Inlet	8,000,000	15,000	2 x 3 mi. to 8 x 8 mi.
Shumagin	84,000,000	8,000	3 x 3 mi. to 50 x 50 mi.
North Aleutian Basin	32,000,000	42,000	2 x 2 mi. to 6 x 6 mi.
Aleutian Arc	54,000,000	< 500	None
St. George Basin	70,000,000	49,000	2 x 2 mi. to 8 x 8 mi.
Bowers Basin	86,000,000	< 1,000	None
Aleutian Basin	160,000,000	< 1,000	None
Navarin Basin	37,000,000	49,000	1 1/2 mi. to 1 1/2 mi. to 3 x 3 mi.
St. Matthew-Hall	51,000,000	3,000	6 x 6 mi. to None
Norton Basin	25,000,000	26,000	2 x 2 mi. to 4 x 6 mi.
Hope Basin	12,000,000	8,000	2 x 6 mi. to 10 x 10 mi.
Chukchi Sea	30,000,000	37,000	3 x 7 mi. to 10 x 20 mi.
Beaufort Sea	49,000,000	40,000	2 x 2 mi. to 5 x 6 mi.
TOTALS	920,000,000	332,500	
ATLANTIC REGION			
North Atlantic	49,000,000	68,000	1/8 x 1/8 mi. to 1 1/2 x 1 1/2 mi.
Mid-Atlantic	82,000,000	55,000	1/8 x 1/8 mi. to 1 1/2 x 1 1/2 mi.
South Atlantic	99,000,000	55,000	1/8 x 1/8 mi. to 3 x 6 mi.
Straits of Florida	13,000,000	2,000	6 x 6 mi. to 20 x 20 mi.
TOTALS	243,000,000	180,000*	
GULF OF MEXICO REGION			
			<u>Shelf</u> <u>Slope</u> <u>Deeper than 2,000 ft.</u>
Eastern GOM	58,000,000	86,000	2 x 2 mi. to 4 x 4 mi. 25 x 25 mi. South 27° - 0
Central GOM	45,000,000	141,000	1 x 1 mi. 2 x 2 mi. 5 x 15 mi.
Western GOM	35,000,000	120,000	1 x 1 mi. 2 x 2 mi. 5 x 15 mi.
TOTALS	138,000,000	347,000	
PACIFIC REGION			
Southern California	30,000,000	62,000	1/2 x 1/2 mi. to 4 x 6 mi.
Central California	15,000,000	19,000	1/2 x 1 mi. to 3 x 3 mi.
Northern California	14,000,000	11,000	1/2 x 1/2 mi. to 4 x 6 mi.
Washington - Oregon	33,000,000	7,000	3 x 4 mi. to none
TOTALS	92,000,000	99,000	
TOTAL MMS	1,393,000,000	958,000	

* Includes data obtained from USGS

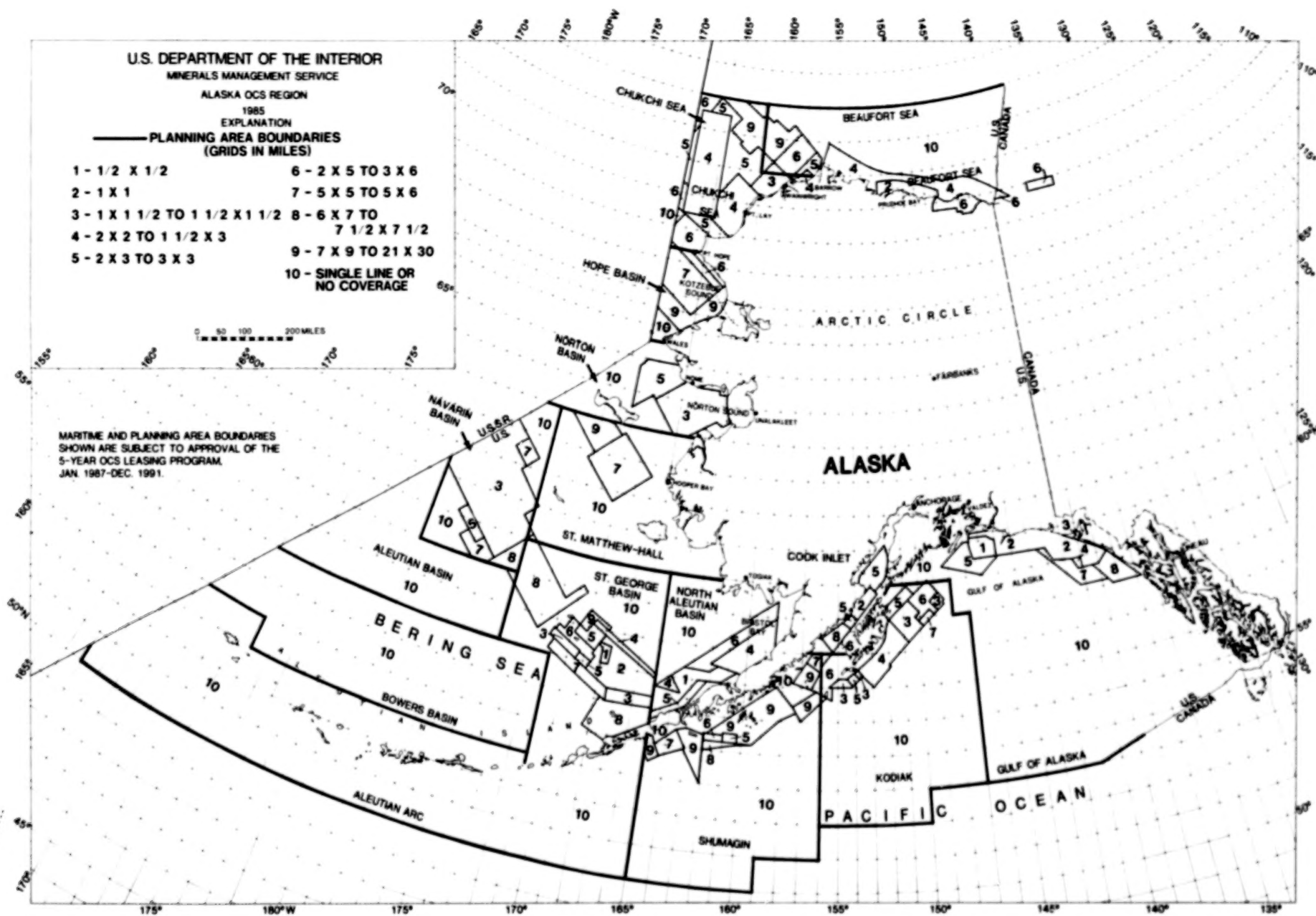


Figure 11.--Map of Alaska Region CDP seismic data coverage

MARITIME AND PLANNING AREA BOUNDARIES
SHOWN ARE SUBJECT TO APPROVAL OF THE
5-YEAR OCS LEASING PROGRAM,
JAN. 1987-DEC. 1991.

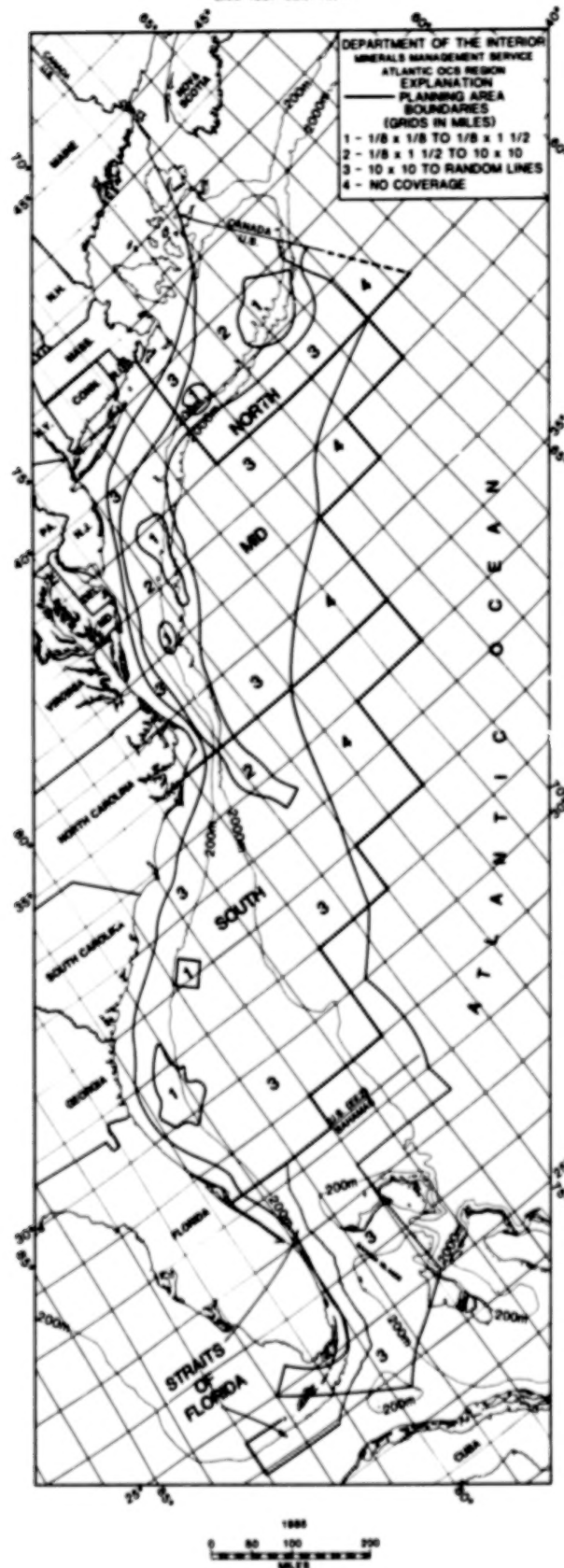


Figure 12.--Map of Atlantic Region CDP seismic data coverage

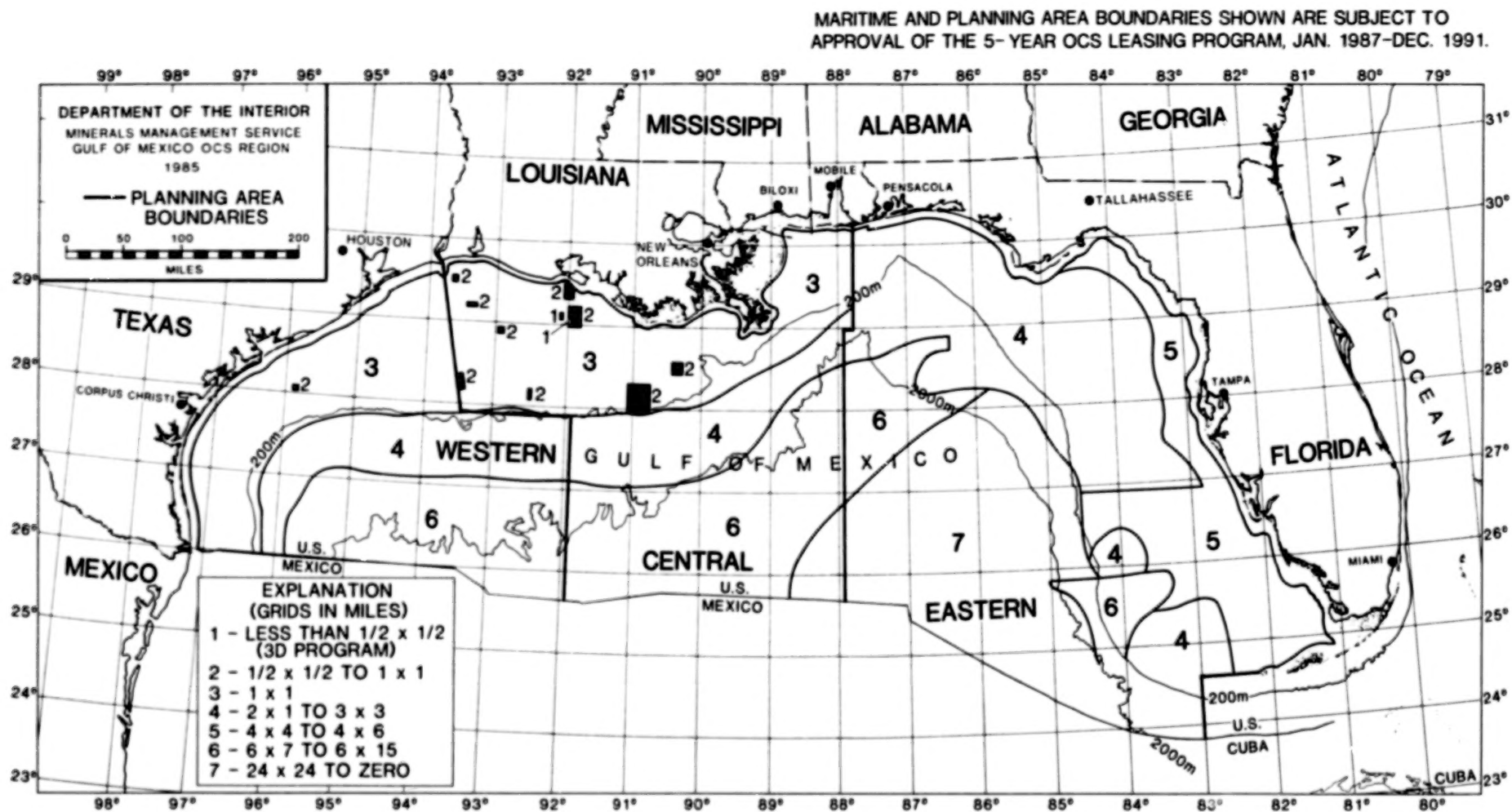


Figure 13.--Map of Gulf of Mexico Region CDP seismic data coverage

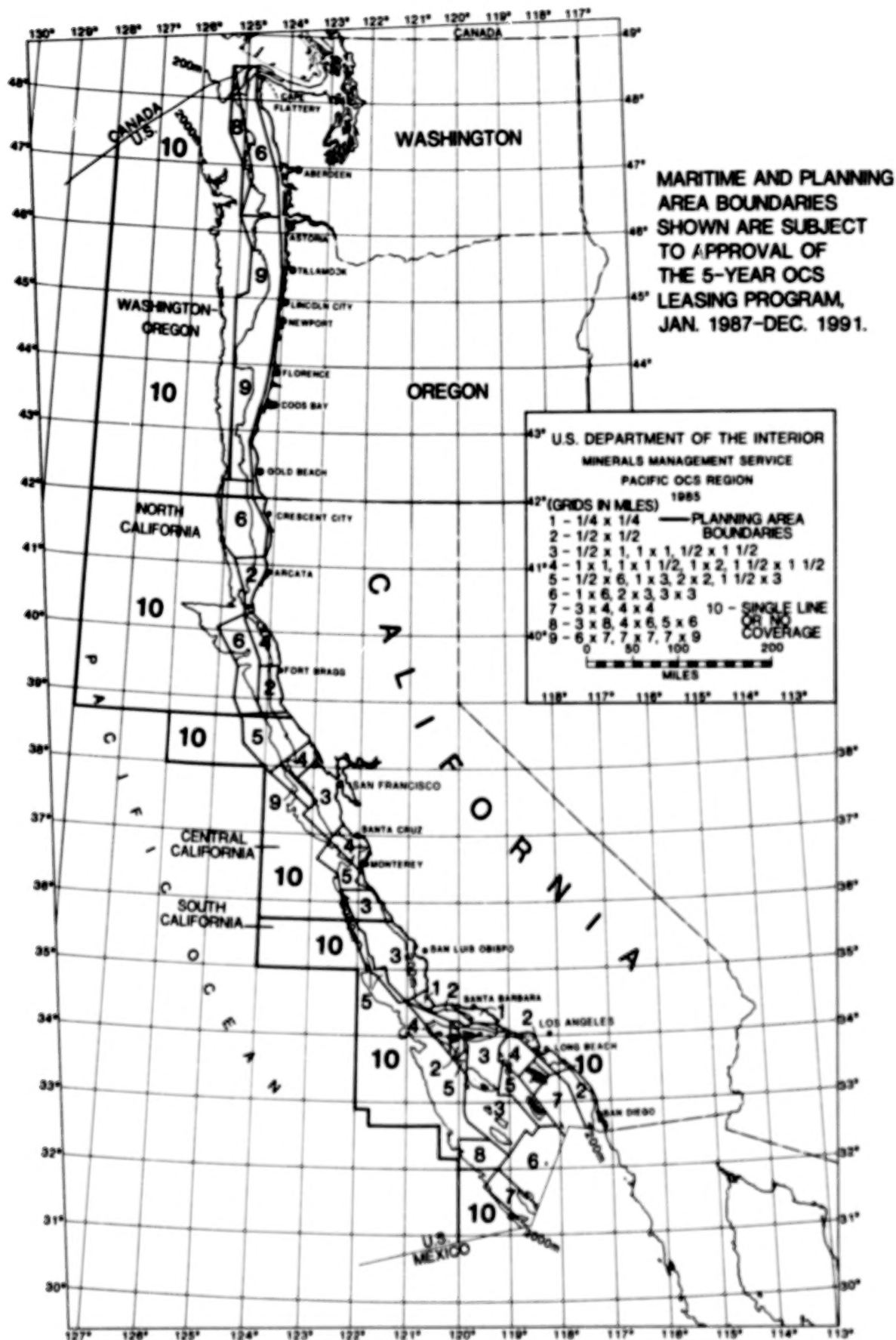


Figure 14.--Map of Pacific Region CDP seismic data coverage

The MMS has not acquired all of the permit data shot and recorded by industry because of budget restrictions to reimbursing the permittees for data reproduction and processing; the lack of the necessary personnel to manage, interpret, and analyze this large volume of data; and the redundancy of data shot on the OCS by different companies.

ANALYSIS OF STATISTICS

Statistics of the G&G data acquisition program are presented in the appendix in the form of tables, graphs, and charts. The general analysis of these statistics are discussed below. For ease of discussion, this section will be divided into permitting and data acquisition.

Geological and/or Geophysical Exploration Permits

As stated earlier in the report, the number of permits issued by the MMS and, thus, the areas for which the permits are issued, are leading indicators of oil and gas activity and its location on the OCS. Table 1A and figures 1A-9A (in the appendix) present the statistics of G&G exploration permitting for the OCS since 1960, with a differentiation between geological permits and geophysical permits from 1969 to 1985. Since most of the permitting activity has been in the GOM Region, this Region was subdivided into its three planning areas on some illustrations to further identify the areas of greatest interest.

The MMS tracks G&G permits by calendar year, so the data for table 1A and figures 1A-9A, derived from table 1A, are based on the calendar year. Figure 1A showing total permits per Region and figure 2A showing the percentage distribution of permits demonstrate that the majority of the oil and gas activity for the OCS has been in the GOM. Figures 3A and 4A, showing the same data but dividing the GOM into planning areas, show that the Central GOM planning area (figure 13-map) has issued more than 50 percent of all permits. The Central GOM planning area is followed by the Western GOM planning area, which has issued 1,929 permits or about 22 percent of the total. These two areas are followed by the Alaska Region (figure 11-map) with 10.4 percent. The Pacific Region (figure 14-map) issued 7.6 percent of the permits followed by the Eastern GOM planning area with 6.6 percent and the Atlantic Region (figure 12-map) with 2.8 percent. These statistics correlate extremely well with the dominant position of the Central GOM Planning Area in the oil and gas activities of the OCS.

Figure 5A displays data from table 1A for total permits between 1969 and 1985 by permit type. Figure 6A shows the G&G permits issued by year from 1969 to 1985 by Region except for the GOM data which are displayed by planning area. Figure 7A shows only geophysical permits for the same period by Region and GOM planning area. Figure 8A is similar to figure 7A, displaying only geological permits. Figure 9A compares G&G permits issued by year and type from 1969 to 1985.

It should be noted that 95.6 percent of the permits issued were for geophysical exploration and that geological exploration permits accounted for only 4.4 percent. Permits for Continental Offshore Stratigraphic Test (COST) wells account for about 10 percent of the geological permits. These statistics illustrate the dominant role that geophysics plays in prelease hydrocarbon exploration.

The overall trends in permitting for all the Regions and GOM planning areas are similar and reflect fluctuations in the price and supply of petroleum. Some regional differences can be detected, which are related to moratoria on leasing, weather conditions, and discoveries of hydrocarbons. Moratoria on leasing and adverse weather conditions decrease exploration activity. Moderate weather and discoveries of the hydrocarbons increase the permitting activity.

Data Acquisition

The MMS records financial and procurement transactions by fiscal year. All figures and tables involving MMS data acquisition from permittees (tables 2A-12A and figures 10A-42A) are based on a fiscal year that begins on October 1 and extends through the following September 30.

Figure 10A shows the total expenditures for G&G data since 1968 for those data presented in table 2A. Figure 11A shows the distribution of G&G expenditures by Region. Alaska had the largest portion of the expenditures (39.6 percent), followed closely by the GOM with 33.5 percent. Alaska has over twice the offshore area of the other three Regions combined, thus Alaska has the largest portion of the expenditures. On the other hand, the GOM with over 95 percent of the OCS production possesses the largest data base. The Atlantic Region (15.2 percent of the expenditures) and the Pacific (11.6 percent) are comparable. The Pacific Region has the smallest slice of the expenditures for G&G data. This is because parts of the California OCS have been under moratoria for much of the 1980's and because of the lack of industry interest in the past in offshore Washington and Oregon.

Table 3A summarizes G&G data acquisition by Region and data type for fiscal years 1968-1985. These data are shown graphically in figure 12A by miles for different types of geophysical survey for each Region and in figure 13A by costs for different types of geophysical data held by each Region.

The information in table 4A is the same data as in table 3A but is presented by data type and Region for fiscal years 1968-1985. These data are shown graphically in figure 14A as miles of each type of geophysical data for each Region and in figure 15A as total cost per geophysical data type for each Region. Each of the Regions has acquired much more CDP data than any other type. All of the Regions, with the exception of the Atlantic Region, spent more on CDP data than any other type. The Atlantic Region spent more on high-resolution (HR) data as these data were

acquired under exclusive contract rather than from permittees. A change in policy in 1982 (described below) altered this situation.

Figures 16A, 17A, and 18A, derived from tables 5A and 6A, compare CDP and HR data by miles acquired, average cost per mile, and total cost for the fiscal years 1968 to 1985. The MMS ceased contracting for HR data when the DOI initiated areawide leasing in 1982. At that time the hazards analysis program, conducted by the Conservation Division of the USGS, was modified. Hazards analysis is the principal application of most of the HR data. Under the previous program, MMS directly acquired prelease, tract-specific, shallow hazards data. Under the areawide leasing program, the detailed shallow hazards analysis function was shifted to the postsale phase and the responsibility for site-specific hazards data collection was placed on the lessee as a condition to obtain a drilling permit. If industry chooses to conduct prelease hazards surveys, G&G permits must be obtained from the MMS. Shallow hazards survey data and information are available to the MMS under terms of permit or lease and regulations. This practice has continued under the focused leasing approach adopted in 1984.

Data from table 7A summarizing the Alaska Region's data acquisition by data type, data quantity, and cost as a function of fiscal year are shown graphically in figures 19A and 20A. The high cost for HR geophysical data in 1980 resulted because the MMS had to contract for exclusive prelease data. Contracts for CDP interpretations were phased out in 1977 as more MMS technical personnel became available to perform the interpretations.

The same type of information presented for the Alaska Region is shown in table 8A and figures 21A and 22A for the Atlantic Region, table 9A and figures 23A and 24A for the GOM Region, and table 10A and figures 25A and 26A for the Pacific Region. Figure 27A compares the cost of data acquisition by Region from data given in tables 7A to 10A. The GOM Region's dominant role in establishing the offshore industry is apparent by its acquisition of the majority of the data before 1976. Since 1976, with the exception of 1977, a significant portion of the MMS G&G data acquisition budget has been expended by the Alaska Region, which oversees the majority of the OCS lands.

Figure 28A, with values computed from tables 7A to 10A, plots the average cost per mile of data for each Region for the years 1976 to 1985. There was a dramatic increase in the average cost per mile for data in the Alaska Region in 1979 and 1980 and for the Atlantic Region in 1980.

In 1979, the Alaska Region purchased a great deal of data shot in State waters where a Federal permit is not applicable. Thus, the reimbursement did not fall under the provisions of the OCSLAA, and MMS was required to pay full price for these data. The price varied from \$1,500 to \$6,000 per mile and is reflected in the unusually high average cost per mile shown on figure 28A for 1980.

In 1980, the Atlantic Region contracted for several sets of exclusive HR data that were used for sales and hazards studies. The high price of exclusive HR data, some well over \$450 per mile, increased the average cost per mile in the Atlantic Region that year. As is shown in table 11A, the average price per mile for data also reached a peak for industry in 1980.

Data acquisitions for each Region are compared to the regional data acquisition by industry in table 11A for the 10-year period 1976 to 1985. The statistics used for geophysical data acquisition by industry were taken from Geophysics for the years prior to 1983 and from Geophysics: The Leading Edge of Exploration for 1983 through 1985. Both of these journals are the official publications of the Society of Exploration Geophysicists (SEG). The SEG figures are given for the calendar year and MMS figures for the fiscal year. The time periods used for correlation of data acquisition by MMS and industry do not coincide exactly, but they do have a 9-month overlap. Furthermore, SEG listed some values for offshore seismic activity as undesignated by Region. An additional factor to consider when correlating the data acquired by MMS with that shot by industry is that most of the data acquired by MMS were permitted 1 year or more before they were acquired. Thus, the comparisons between MMS and industry are the best estimates available.

Figure 29A compares the yearly data acquisitions between industry and the Alaska Region from 1976 to 1985. The line miles of data acquired that are plotted include both CDP and HR reflection data. Figure 30A compares the amount of money industry and MMS spent in acquiring data for the Alaska Region from 1976 to 1985. Similar data for the other three Regions are presented in figures 31A and 32A for the Atlantic Region, figures 33A and 34A for the GOM Region, and figures 35A and 36A for the Pacific Region. From these graphs, it is obvious that industry acquires substantially more data than MMS. This is particularly true for the GOM and Pacific Regions. Industry's budget for geophysical data acquisition is much greater than MMS's as shown in table 11A and the accompanying graphs.

Figure 37A compares the total line miles acquired by industry and MMS in the four Regions from the data in table 11A. Figure 38A compares the total cost for data acquired by each Region and the corresponding cost for industry. These values are the totals of the dollar amounts given in table 11A. MMS has acquired approximately 70 percent of the data shot by industry in the Alaska OCS. Alaska is a large frontier area with limited data coverage by industry, a fact which necessitates MMS to acquire as much of these data as feasible.

The MMS acquired more data in the Atlantic Region than industry between 1976 and 1984. Before 1976 the MMS data base was limited because industry had shown very little interest in leasing this frontier area, although industry had been acquiring geophysical data. During the period 1976 to 1984, MMS not only acquired a majority of the industry data, but pur-

chased much of the pre-1976 data. The MMS acquired 1.13 times the data recorded by industry during this period at approximately 20 percent of industry costs. This favorable cost for data results from the OCSLAA which requires MMS to pay only for data reproduction and certain processing costs.

Similarly, in the GOM, industry acquired 8 times more data than MMS at a cost of about 10 times the MMS reimbursement for data. Industry has acquired such a large quantity of data in the GOM that MMS requires only about 15 percent of the data that are currently being shot. In the Pacific Region, MMS has acquired about a third of the data held by industry. Proportionally, MMS expenditures for data have been much less than industry's. Some of the reasons MMS does not acquire all the data held by industry are as follows:

- ° Industry does not share data, so some of it is redundant,
- ° Difference in data quality,
- ° Budgetary constraints, and
- ° Personnel limitations for data reduction and interpretation.

Table 12A summarizes a comparison between industry and MMS for OCS-wide marine seismic data acquisition (CDP and HR) for the years 1976 to 1985. It includes both quantities and costs as a function of fiscal year. These data are compared graphically in figures 39A, 40A, and 41A. Figure 39A compares line mileage acquired by industry and MMS. In all years from 1976 through 1985, industry shot more data than MMS acquired. The MMS acquired more data in 1976 than in subsequent years because of the sale schedule. Both Alaska and Atlantic Regions held their first sales in that year, and both Regions required large quantities of data to prepare for the sales. Both Regions held three sales within a 12-month period. The GOM, also, had an accelerated schedule and required an above average amount of data in 1976.

Figure 40A compares industry expenditures for seismic reflection data with those of MMS. Industry funding increased steadily from 1976 to 1982 where it appears to stabilize. Compared with industry, MMS funding has been relatively constant for the past 9 to 10 years. Figure 41A compares the data acquisition costs per mile between industry and MMS. This graph shows there was a steady rise in the average cost per mile from 1976 to 1980, at which time the cost stabilized at approximately \$1,300 per mile. Two factors contributing to the increase were 1) significant processing costs with the shift to digital data recording and processing and 2) inflation. The peak in MMS cost per line mile in 1980 was the result of MMS contracts for HR data for hazards studies on an exclusive basis.

Figure 42A compares the average cost per line mile between industry and MMS for each Region. These data were computed from table 11A and summed in table 12A. Figure 42A shows that

the average cost per line mile is approximately 10 to 15 percent higher in Alaska for both industry and MMS. This is a result of more severe weather conditions and a shorter work season for industry and the inclusion of expensive data from State waters for the MMS average. The average cost per line mile in the other three Regions is approximately the same.

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Table 1A.--Number of permits granted for geological and/or geophysical exploration in the Outer Continental Shelf

YEAR	ALASKA				ATLANTIC				GULF OF MEXICO												TOTAL					
									CENTRAL			WESTERN				EASTERN			PACIFIC							
	a	b	c	d	a	b	c	d	a	b	c	a	b	c	d	a	b	c	d							
1960-1968	75				45				1290			613			168			162			2353					
1969	31	28	3		7	7			127	127		60	57	3	20	20		13	10	3	258	249	9			
1970	40	33	7		4	3	1		108	105	3	47	46	1	11	11		3	2	1	213	200	13			
1971	27	26	1		4	4			126	123	3	38	38		15	14	1	0			210	205	5			
1972	17	17			4	4			130	122	8	42	41	1	26	25	1	1	1		220	210	10			
1973	33	29	4		4	4			133	129	4	55	55		84	80	4	30	21	9	339	318	21			
1974	47	44	3		2	2			174	170	4	103	98	5	2	7	7	24	24		357	345	12	2		
1975	80	71	9	1	29	23	6	1	251	247	4	92	91	1	10	10		46	42	4	1	508	484	24	3	
1976	68	59	9	4	35	28	7	3	195	194	1	89	87	2	8	8		24	22	2		419	398	21	7	
1977	33	29	4	4	20	20			269	266	3	88	87	1	11	8	3	31	26	5		452	436	16	4	
1978	9	8	1		17	13	4	1	165	165		97	97		16	16		38	30	8	1	342	329	13	2	
1979	32	30	2		9	9			126	122	4	73	71	2	12	11	1	24	22	2		276	265	11		
1980	40	35	5	1	15	15			142	138	4	65	64	1	24	23	1	31	26	5		317	301	16	1	
1981	54	49	5		17	16	1		177	175	2	69	68	1	37	37		40	38	2		394	383	11		
1982	85	77	8	3	11	11			226	224	2	100	99	1	18	18		62	59	3		502	488	14	3	
1983	100	79	21	1	10	10			267	267		108	108		41	41		45	36	9		571	541	30	1	
1984	70	62	8		6	6			260	258	2	114	113	1	37	37		56	42	14		543	518	25		
1985	63	56	7		2	1	1		193	190	3	76	74	2	31	31		33	30	3		398	382	16		
TOTALS	904	732	97	14	241	176	20	5	4359	3022	47	1929	1294	22	2	576	397	11	663	431	70	2	8672	6053	267	23

Notes:

a = Total number of geological and geophysical permits (exclusive of COST wells).

b = Number of geophysical permits.

c = Number of geological permits.

d = Number of geological permits for deep stratigraphic tests (Continental Offshore Stratigraphic Test (COST) wells)

"TOTALS" includes number of geological and geophysical permits issued 1960-1985, number of geophysical and geological permits issued 1969-1985, and COST well permits issued 1960-1985.

Table 2A.--Summary of expenditures for geological and geophysical data acquisition,
FY 1968-1985

FY	Alaska	Atlantic	Gulf of Mexico	Pacific	General Accounts*	Total
1968-1975	\$ 3,162,548	\$ 361,686	\$ 9,414,042	\$ 1,443,987	\$ 509,517	\$ 14,891,780
1976	3,496,607	2,504,710	3,281,698	581,670	50,197	9,914,882
1977	450,161	2,287,390	3,764,678	1,147,968	69,777	7,719,974
1978	3,421,269	906,989	1,842,701	416,463	-----	6,587,422
1979	6,240,687	232,085	1,573,094	2,272,407	702,025	11,020,298
1980	6,972,885	4,469,762	4,388,508	1,412,062	-----	17,243,217
1981	6,842,045	1,530,898	1,168,618	866,656	-----	10,408,217
1982	1,864,661	1,945,270	2,943,602	1,996,271	-----	8,749,804
1983	5,673,514	1,738,427	3,802,409	1,312,596	-----	12,526,946
1984	4,751,354	1,580,008	4,246,742	1,286,598	-----	11,864,702
1985	3,676,375	318,260	2,959,989	861,687	-----	7,816,311
TOTAL	\$46,552,106	\$17,875,485	\$39,386,081	\$13,598,365	\$1,331,516	\$118,743,553

* Funds transferred to the Marine Geology Branch, U.S. Geological Survey, for geological and geophysical data acquisition.

Table 3A.--Summary of geological and geophysical data acquisition
by region and data type, FY 1968-1985

Region	Data Type	Miles	Cost
Alaska	Common Depth Point (CDP)	332,402	\$31,436,665
	High-Resolution (HR)	55,878	11,115,106
	CDP Interpretations	84,683	439,793
	Gravity and Magnetic Data	162,089	687,150
	Miscellaneous*	-----	2,873,392
	Total	635,052	\$46,552,106
Atlantic	Common Depth Point (CDP)	166,308	\$ 7,068,914
	High-Resolution (HR)	49,509	9,751,232
	CDP Interpretations	44,801	55,274
	Gravity and Magnetic Data	15,783	2,902
	Miscellaneous*	-----	997,164
	Total	276,401	\$17,875,486
Gulf of Mexico	Common Depth Point (CDP)	346,746	\$22,857,944
	High-Resolution (HR)	145,768	12,729,139
	CDP Interpretations	139,418	856,526
	Gravity and Magnetic Data	75,942	514,734
	Miscellaneous*	-----	2,425,990
	Total	707,874	\$39,384,333
Pacific	Common Depth Point (CDP)	99,622	\$ 8,134,894
	High-Resolution (HR)	30,582	3,696,394
	CDP Interpretations	42,365	72,175
	Gravity and Magnetic Data	110,150	534,363
	Miscellaneous*	-----	1,160,539
	Total	282,719	\$13,598,365
General Accounts**		-----	\$ 1,331,516
Grand Total		1,902,046	\$118,741,805

* Field tapes, special processing, navigation tapes, geological and geo-chemical data, etc.

** Funds transferred to the Office of Marine Geology, Geologic Division, U.S. Geological Survey, for geological and geophysical data acquisition.

Table 4A.--Summary of geological and geophysical data acquisition
by data type and region, FY 1968-1985

Data Type	Region	Miles	Cost
Common Depth Point (CDP)	Alaska	332,402	\$31,436,665
	Atlantic	166,308	7,068,914
	Gulf of Mexico	346,746	22,857,944
	Pacific	99,622	8,134,893
Total		945,078	\$69,498,416
High Resolution (HR)	Alaska	55,878	\$11,115,106
	Atlantic	49,509	9,751,232
	Gulf of Mexico	145,768	12,729,139
	Pacific	30,582	3,696,394
Total		281,737	\$37,291,871
CDP Interpretations	Alaska	84,683	\$ 439,793
	Atlantic	44,801	55,274
	Gulf of Mexico	139,418	856,526
	Pacific	42,365	72,175
Total		311,267	\$1,423,768
Gravity and Magnetic	Alaska	162,089	\$687,150
	Atlantic	15,783	2,902
	Gulf of Mexico	75,942	514,734
	Pacific	110,150	534,363
Total		363,964	\$1,739,149
Miscellaneous*	Alaska	-----	\$2,873,392
	Atlantic	-----	997,164
	Gulf of Mexico	-----	2,425,990**
	Pacific	-----	1,160,539
Total			\$7,457,085
General Accounts**		-----	\$1,331,516
Grand Total		1,902,046	\$118,741,805

* Field tapes, special processing, navigation tapes, geological and geo-chemical data, etc.

** Estimated funds transferred to the Office of Marine Geology, Geologic Division, U.S. Geological Survey, for geological and geophysical data acquisition.

Table 5A.--Summary of common depth point seismic data acquisition,
FY 1968-1985

Fiscal Year	Miles	Cost	Average Cost (\$/Mile)
1968-1975	263,538	\$ 9,065,769	\$34
1976	108,965	3,800,644	35
1977	36,916	1,282,416	35
1978	52,241	4,005,779	77
1979	30,395	3,138,861	103
1980	19,400	1,774,896	91
1981	69,886	7,039,690	101
1982	83,082	8,556,077	103
1983	119,484	12,380,390	104
1984	89,853	10,880,280	121
1985	71,318	7,573,615	106
Totals	945,078*	\$69,498,417	\$74

Average cost 1968-1985-----\$74/Mile

* Includes data obtained under permit only; does not include data obtained from USGS.

Table 6A.--Summary of high-resolution seismic data, FY 1968-1984

Fiscal Year	Miles	Cost	Average Cost (\$/Mile)
1968-1975	105,760	\$ 3,095,162	\$ 29
1976	54,826	4,426,757	81
1977	35,804	5,829,474	163
1978	9,430	1,462,541	155
1979	17,008	4,557,904	268
1980	38,773	15,094,328	389
1981	12,232	2,806,467	229
1984	7,904*	19,238*	2
Totals	281,737	37,291,871	\$132

Average Cost 1968-1981-----\$132/Mile

* Not purchased under exclusive contract.

Table 7A.--Summary of geological and geophysical data acquisition for Alaska Region, FY 1968-1985

Fiscal Year	CDP Seismic		HR Seismic		CDP Interp.		Gravity & Magnetic		Misc. *	Total	
	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Cost(\$)	Miles	Cost(\$)
1968-1975	70,306	2,803,939	5,500	119,700	32,819	160,832	55,710	7,515	70,562	164,335	3,162,548
1976	37,785	1,628,153	19,163	1,598,789	30,164	268,961	-----	-----	704	87,112	3,496,607
1977	11,952	271,035	5,606	36,473	21,700	10,000	23,470	49,450	83,203	62,728	450,161
1978	28,524	2,956,280	-----	-----	-----	-----	36,625	408,679	56,310	65,149	3,421,269
1979	8,538	2,180,700	5,412	2,019,512	-----	-----	25,465	125,148	1,915,327	39,415	6,240,687
1980	10,109	1,086,423	7,703	5,789,936	-----	-----	-----	-----	96,526	17,812	6,972,885
1981	35,430	5,231,130	4,590	1,531,458	-----	-----	14,969	69,286	10,171	54,989	6,842,045
1982	16,624	1,817,736	-----	-----	-----	-----	-----	-----	46,925	16,624	1,864,661
1983	51,903	5,673,514	-----	-----	-----	-----	-----	-----	-----	51,903	5,673,514
1984	30,961	4,118,626	7,904	19,238	-----	-----	5,850	27,072	586,418	44,715	4,751,354
1985	30,270	3,669,129	-----	-----	-----	-----	-----	-----	7,246	30,270	3,706,645
Total	332,402	31,436,665	55,878	11,115,106	84,683	439,793	162,089	687,140	2,873,392	635,052	46,552,096

* Field tapes, special processing, navigation tapes, geological and geochemical data, etc.

Table 8A.--Summary of geological and geophysical data acquisition for Atlantic Region, FY 1968-1985

Fiscal Year	CDP Seismic		HR Seismic		CDP Interp.		Gravity & Magnetic		Misc.*	Total	
	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Cost(\$)	Miles	Cost(\$)
1968-1975	35,682	309,029	1,740	4,900	11,802	-----	14,267	-----	47,757	63,491	361,686
1976	25,254	196,687	23,867	2,256,167	29,822	45,282	1,076	2,902	3,672	80,019	2,504,710
1977	15,140	242,868	6,100	1,968,513	3,177	9,992	440	-----	66,017	24,857	2,287,390
1978	12,096	581,562	-----	-----	-----	-----	-----	-----	325,427	12,096	906,989
1979	5,783	119,250	-----	-----	-----	-----	-----	-----	112,835	5,783	232,085
1980	585	51,096	10,660	4,278,448	-----	-----	-----	-----	140,218	11,245	4,469,762
1981	9,932	179,682	7,142	1,243,204	-----	-----	-----	-----	108,012	17,074	1,530,898
1982	22,195	1,882,723	-----	-----	-----	-----	-----	-----	62,547	22,195	1,945,270
1983	28,818	1,718,584	-----	-----	-----	-----	-----	-----	19,843	28,818	1,738,427
1984	9,386	1,500,298	-----	-----	-----	-----	-----	-----	79,710	9,386	1,580,008
1985	1,437	287,135	-----	-----	-----	-----	-----	-----	31,126	1,437	318,261
Total	166,308	7,068,914	49,509	9,751,232	44,801	55,274	15,783	2,902	997,164	276,401	17,875,486

* Field tapes, special processing, navigation tapes, geological and geochemical data, etc.

Table 9A.--Summary of geological and geophysical data acquisition for Gulf of Mexico Region, FY 1968-1985

Fiscal Year	CDP Seismic		HR Seismic		CDP Interp.		Gravity & Magnetic		Misc.*	Total	
	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Cost(\$)	Miles	Cost(\$)
1968-1975	143,458	5,255,068	88,549	2,795,562	120,038	722,442	19,670	129,500	511,470	371,715	9,414,042
1976	31,474	1,489,665	9,367	514,141	19,380	134,084	56,272	385,234	758,574	116,493	3,281,698
1977	4,485	579,583	18,119	3,072,088	-----	-----	-----	-----	113,007	22,604	3,764,678
1978	7,188	330,183	8,275	1,438,856	-----	-----	-----	-----	73,662	15,463	1,842,701
1979	11,681	492,299	5,018	949,697	-----	-----	-----	-----	131,098	16,699	1,573,094
1980	4,758	388,329	15,940	3,926,990	-----	-----	-----	-----	73,189	20,698	4,388,508
1981	16,454	939,506	500	31,805	-----	-----	-----	-----	197,307	16,954	1,168,618
1982	28,700	2,936,727	-----	-----	-----	-----	-----	-----	6,875	28,700	2,943,602
1983	26,290	3,678,684	-----	-----	-----	-----	-----	-----	123,725	26,290	3,802,409
1984	40,828	3,999,326	-----	-----	-----	-----	-----	-----	247,416	40,828	4,246,742
1985	31,430	2,768,574	-----	-----	-----	-----	-----	-----	191,415	31,430	2,959,989
Total	346,746	22,857,944	145,768	12,729,139	139,418	856,526	75,942	514,734	2,427,738	707,874	39,386,081

* Field tapes, special processing, navigation tapes, geological and geochemical data, etc.

Table 10A.--Summary of geological and geophysical data acquisition for Pacific Region, FY 1968-1985

Fiscal Year	CDP Seismic		HR Seismic		CDP Interp.		Gravity & Magnetic		Misc.*	Total	
	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Miles	Cost(\$)	Cost(\$)	Miles	Cost(\$)
1968-1975	14,092	697,733	9,971	175,000	15,552	49,617	87,637	415,913	105,724	127,252	1,443,987
1976	14,452	486,139	2,429	57,660	2,288	20,596	1,851	17,275	-----	21,020	581,670
1977	5,339	188,930	5,979	752,400	24,525	1,962	3,950	11,796	192,880	39,793	1,147,968
1978	4,433	137,754	1,155	23,685	-----	-----	-----	-----	255,024	5,588	416,463
1979	4,393	346,612	6,578	1,588,695	-----	-----	-----	-----	337,100	10,971	2,272,407
1980	3,948	249,048	4,470	1,098,954	-----	-----	-----	-----	64,060	8,418	1,412,062
1981	8,070	689,372	-----	-----	-----	-----	3,662	20,029	157,255	11,732	866,656
1982	15,563	1,918,891	-----	-----	-----	-----	13,050	69,350	8,030	28,613	1,996,271
1983	12,473	1,309,608	-----	-----	-----	-----	-----	-----	2,988	12,473	1,312,596
1984	8,678	1,262,030	-----	-----	-----	-----	-----	-----	24,568	8,678	1,286,598
1985	8,181	848,777	-----	-----	-----	-----	-----	-----	12,910	8,181	861,687
Total	99,622	8,134,894	30,582	3,696,394	42,365	72,175	110,150	534,363	1,160,539	282,719	13,598,365

* Field tapes, special processing, navigation tapes, geological and geophysical data, etc.

Table 11A.--Comparison of seismic data costs for MMS and industry by region and year, 1976-1985¹

1976	Alaska		Atlantic		Gulf of Mexico		Pacific	
	Industry	MMS	Industry	MMS	Industry	MMS	Industry	MMS
Number of line miles ²	65,393	56,948	7,786	49,121	28,017	40,841	18,209	16,881
Total acquisition/reimbursement cost(\$) ²	17,679,942	3,226,942	1,903,000	2,452,854	6,919,500	2,003,806	6,604,090	543,799
Average acquisition cost(\$/Mile)	270	-----	244	-----	247	-----	363	-----
Average processing cost(\$/Mile)	350	-----	350	-----	350	-----	350	-----
Total average cost (\$/Mile)	620	57	594	50	597	49	713	32
1977								
Number of line miles ³	11,458	17,558	25,792	21,240	44,253	22,604	15,173	11,318
Total acquisition/reimbursement cost(\$) ³	2,800,000	307,508	9,693,650	2,211,381	18,326,815	3,651,671	5,902,350	941,330
Average acquisition cost(\$/Mile)	244	-----	376	-----	414	-----	389	-----
Average processing cost(\$/Mile)	350	-----	350	-----	350	-----	350	-----
Total average cost (\$/Mile)	594	18	726	104	764	162	739	83

¹ Industry reports statistics by calendar year, MMS by fiscal year.

² Does not include 106,914 line miles/\$30,959,270 acquisition costs for regions undesignated by industry.

³ Does not include 28,000 line miles/\$10,200,000 acquisition costs for regions undesignated by industry.

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Table 11A.--Comparison of seismic data costs for MMS and industry by region and year, 1976-1985--continued

1978	Alaska		Atlantic		Gulf of Mexico		Pacific	
	Industry ¹	MMS	Industry	MMS	Industry	MMS	Industry	MMS
Number of line miles	18,887	28,524	8,822	12,096	135,979	15,463	29,806	5,588
Total acquisition/reimbursement cost(\$)	9,489,740	2,956,280	3,718,931	581,562	58,087,778	1,769,039	15,044,778	161,439
Average acquisition cost(\$/Mile)	502	-----	422	-----	427	-----	505	-----
Average processing cost(\$/Mile)	500	-----	500	-----	500	-----	500	-----
Total average cost (\$/Mile)	1,002	104	922	48	927	114	1,005	29
1979								
Number of line miles	14,592	13,950	1,960	5,783	164,752	16,699	26,500	10,971
Total acquisition/reimbursement cost(\$)	14,230,155	4,200,212	1,625,300	119,250	64,325,239	1,441,996	10,587,816	1,935,307
Average acquisition cost(\$/Mile)	975	-----	829	-----	390	-----	400	-----
Average processing cost(\$/Mile)	575	-----	575	-----	575	-----	575	-----
Total average cost (\$/Mile)	1,550	301	1,404	21	965	86	975	176

¹ Based on offshore Canada; 1978-1979 industry statistics for Alaska are not available.

Table 11A.--Comparison of seismic data costs for MMS and industry by region and year, 1976-1985--continued

1980	Alaska		Atlantic		Gulf of Mexico		Pacific	
	Industry ¹	MMS	Industry	MMS	Industry	MMS	Industry	MMS
Number of line miles ²	26,953	17,812	13,513	11,245	138,018	20,698	39,843	8,418
Total acquisition/reimbursement cost(\$) ²	27,359,098	6,876,359	6,090,400	4,329,544	81,567,360	4,315,319	37,085,844	1,348,002
Average acquisition cost(\$/Mile)	1,015	-----	451	-----	591	-----	931	-----
Average processing cost(\$/Mile)	650	-----	650	-----	650	-----	650	-----
Total average cost (\$/Mile)	1,665	386	1,101	385	1,241	208	1,581	160
1981								
Number of line miles ³	45,767	40,020	28,115	17,074	155,397	16,954	21,024	8,070
Total acquisition/reimbursement cost(\$) ³	28,599,966	6,762,588	17,513,506	1,422,886	97,470,070	971,311	10,505,442	689,372
Average acquisition cost(\$/Mile)	625	-----	623	-----	627	-----	500	-----
Average processing cost(\$/Mile)	650	-----	650	-----	650	-----	650	-----
Total average cost (\$/Mile)	1,275	169	1,273	83	1,277	57	1,150	85

¹ Based on offshore Canada for 1980 (industry statistics for Alaska are not available).

² Does not include 11,320 line miles/\$17,851,840 acquisition costs for regions undesignated by industry.

³ Does not include 87,890 line miles/\$51,050,841 acquisition costs for regions undesignated by industry.

Table 11A.--Comparison of seismic data costs for MMS and industry by region and year, 1976-1985--continued

1982	Alaska		Atlantic		Gulf of Mexico		Pacific	
	Industry	MMS	Industry	MMS	Industry	MMS	Industry	MMS
Number of line miles ¹	68,658	16,624	43,696	22,195	377,485	28,700	50,716	15,563
Total acquisition/reimbursement cost(\$) ¹	53,173,000	1,817,736	28,766,867	1,882,723	192,041,644	2,936,727	35,502,000	1,918,891
Average acquisition cost(\$/Mile)	774	-----	658	-----	509	-----	700	-----
Average processing cost(\$/Mile)	700	-----	700	-----	700	-----	700	-----
Total average cost (\$/Mile)	1,474	109	1,358	85	1,209	102	1,400	123
1983								
Number of line miles ²	55,854	51,903	6,931	28,818	295,254	26,290	52,762	12,473
Total acquisition/reimbursement cost(\$) ²	38,483,800	5,673,514	2,508,000	1,718,584	161,125,900	3,678,684	31,843,800	1,309,608
Average acquisition cost(\$/Mile)	689	-----	362	-----	546	-----	604	-----
Average processing cost(\$/Mile)	765	-----	765	-----	765	-----	765	-----
Total average cost (\$/Mile)	1,455	109	1,169	60	1,330	140	1,381	105

¹ Does not include 17,909 line miles/\$12,000,000 acquisition costs for regions undesignated by industry.

² Does not include 58,426 line miles/\$40,926,000 acquisition costs for regions undesignated by industry.

Table 11A.--Comparison of seismic data costs for MMS and industry by region and year, 1976-1985--continued

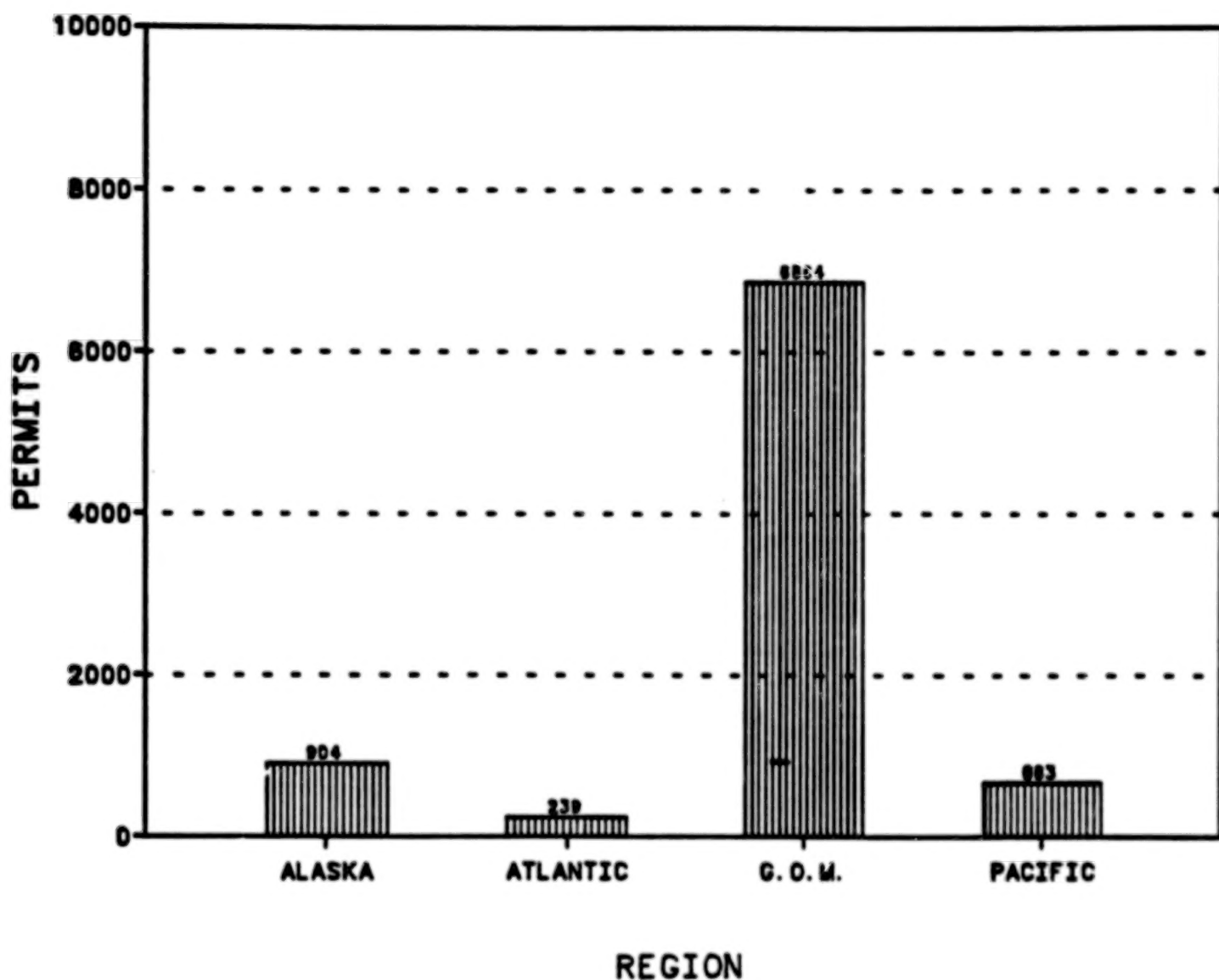
1984	Alaska		Atlantic		Gulf of Mexico		Pacific	
	Industry	MMS	Industry	MMS	Industry	MMS	Industry	MMS
Number of line miles ¹	69,010	38,865	15,101	9,386	323,429	40,828	23,404	8,678
Total acquisition/reimbursement cost(\$) ¹	42,105,000	4,137,864	8,667,720	1,500,298	177,559,380	3,999,326	12,099,500	1,262,030
Average acquisition cost(\$/Mile)	610	-----	574	-----	549	-----	517	-----
Average processing cost(\$/Mile)	765	-----	765	-----	765	-----	765	-----
Total average cost (\$/Mile)	1,337	106	1,308	160	1,288	98	1,262	145
1985								
Number of line miles	5,538	30,270	2,102	1,437	476,100	31,430	71,336	8,181
Total acquisition/reimbursement cost(\$)	2,681,000	3,669,129	1,190,000	287,135	270,653,000	2,768,574	35,831,000	848,777
Average acquisition cost(\$/Mile)	484	-----	566	-----	568	-----	502	-----
Average processing cost(\$/Mile)	565	-----	565	-----	565	-----	562	-----
Total average cost (\$/Mile)	1,049	121	1,131	200	1,133	88	1,067	104

¹ Does not include 107,520 line miles/\$45,000,000 acquisition costs for regions undesignated by industry.

Table 12A.--Summary of expenditures for OCS-wide seismic data acquisition for MMS and industry, 1976-1985

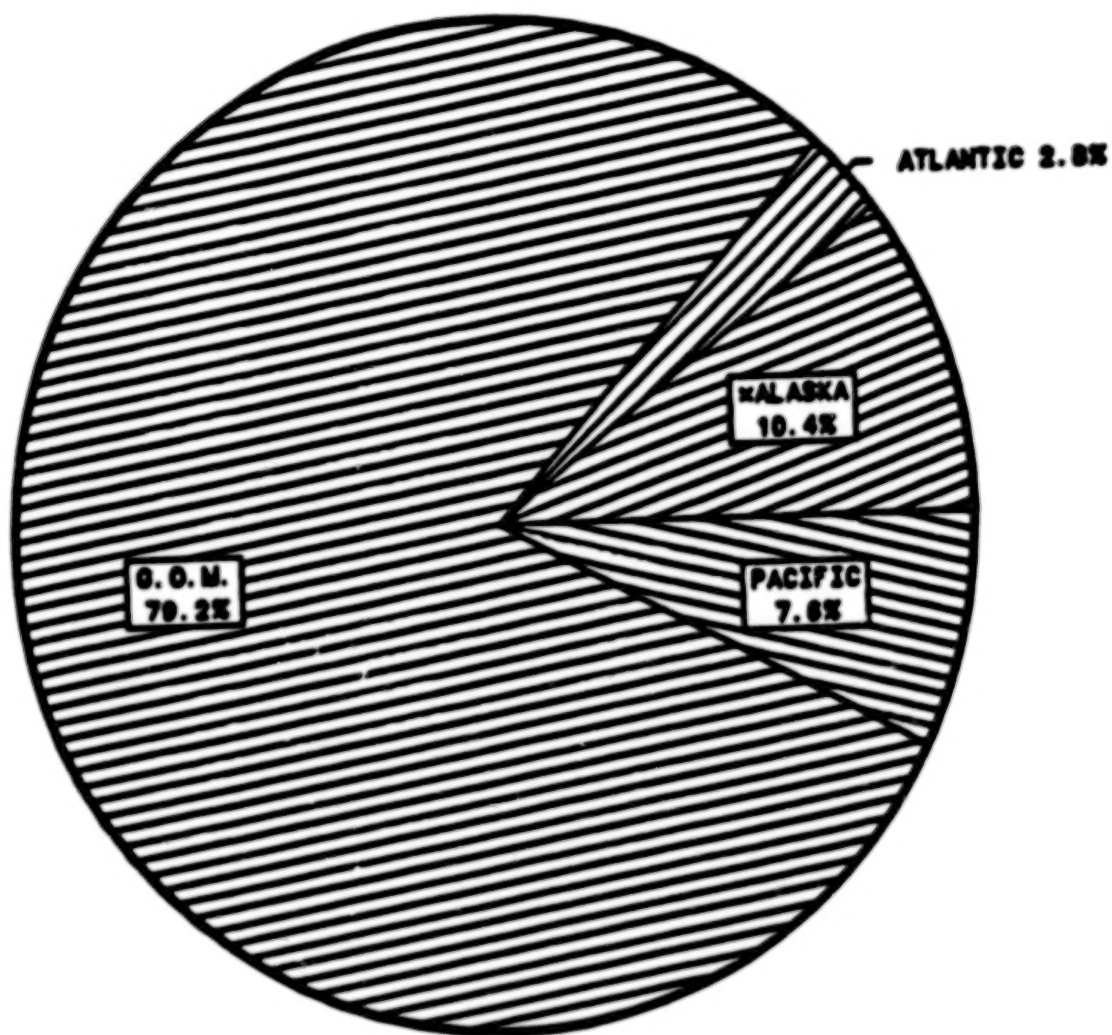
Year ¹	INDUSTRY					MMS		
	Total Miles	Total Acquisition Cost(\$)	Average Acquisition Cost(\$/Mile)	Average Processing Cost(\$/Mile)	Total Average Cost(\$/Mile)	Total Miles	Total Reimbursement Cost(\$)	Total Average Cost(\$/Mile)
1976	226,319	64,065,802	283	350	633	163,791	8,227,401	50
1977	124,676	46,922,815	376	350	726	72,720	7,111,890	98
1978	193,494	86,341,227	446	500	946	61,671	5,468,320	89
1979	207,804	90,768,510	437	575	1,012	47,403	7,696,765	162
1980	229,647	169,954,542	740	650	1,390	58,173	16,869,224	290
1981	338,201	205,139,825	607	650	1,257	82,118	9,846,157	120
1982	558,464	321,483,511	576	700	1,276	83,082	8,556,077	103
1983	469,227	274,887,500	586	765	1,351	119,484	12,380,390	104
1984	538,464	285,431,600	530	765	1,295	97,757	10,899,518	111
1985	555,076	310,355,000	559	565	1,124	71,318	7,573,615	106

¹ Industry reports by calendar year, MMS by fiscal year.



 GEOLOGICAL & GEOPHYSICAL PERMITS

Figure 1A.—Geological and geophysical permits by region, 1960-1985



REGION	PERMITS
ALASKA	904
ATLANTIC	241
GULF OF MEXICO	6864
PACIFIC	663
TOTAL	8672

Figure 2A.--Percentage distribution of geological and geophysical permits by region, 1960-1985

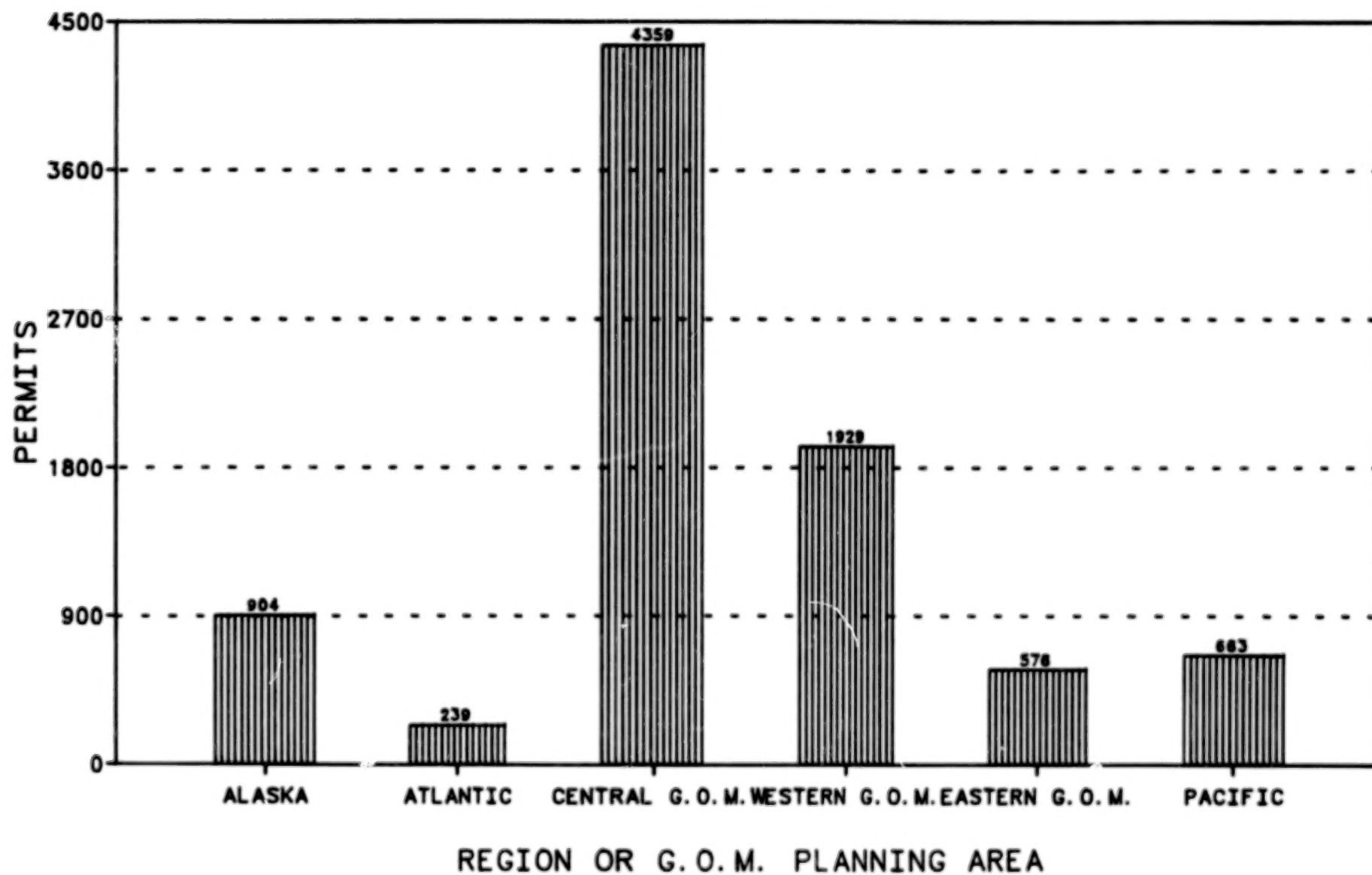
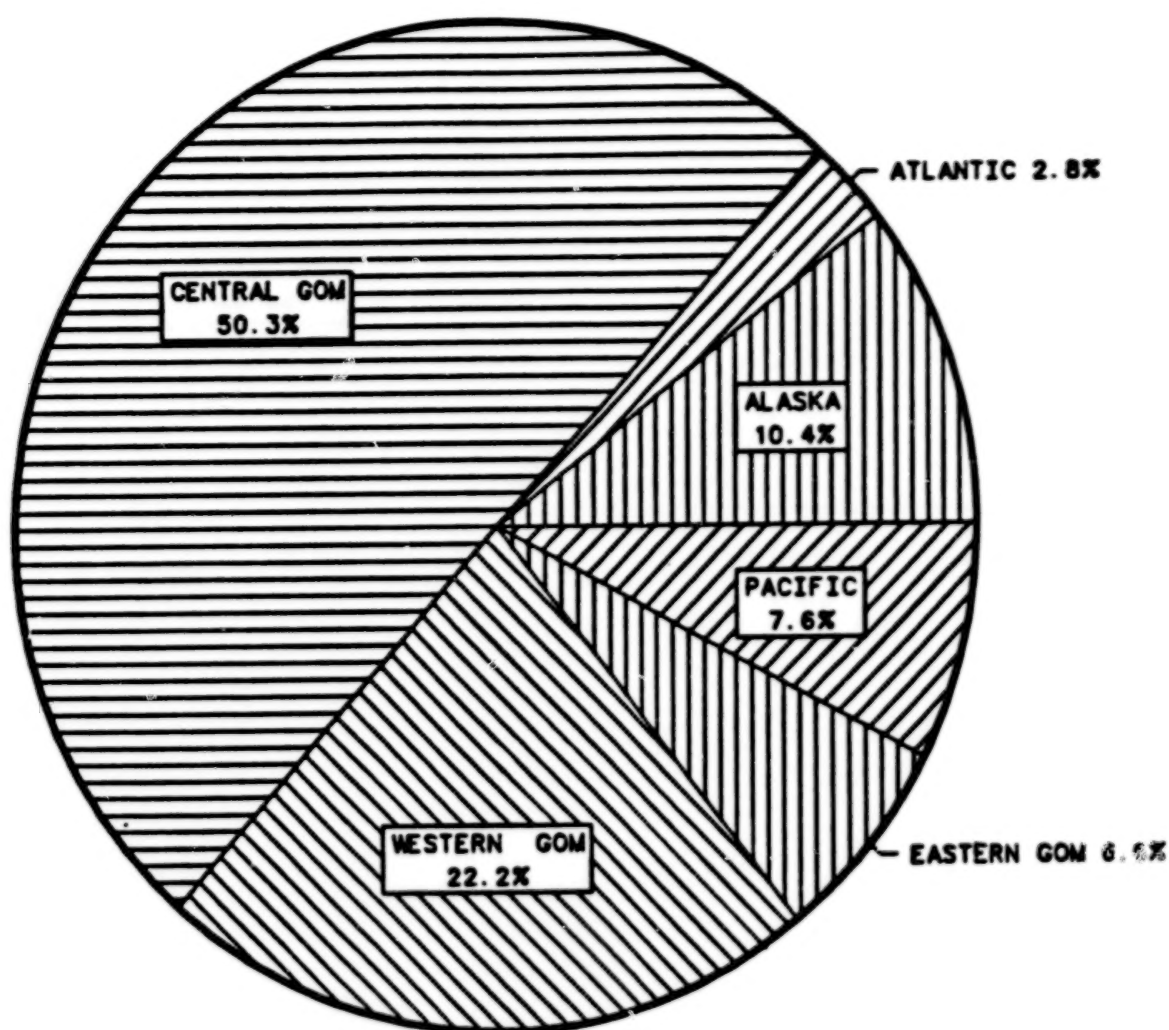


Figure 3A.--Geological and geophysical permits by region or Gulf of Mexico planning area, 1960-1985



REGION	PERMITS
ALASKA	904
ATLANTIC	241
CENTRAL GOM PLANNING AREA	4359
WESTERN GOM PLANNING AREA	1929
EASTERN GOM PLANNING AREA	576
PACIFIC	663
TOTAL	8672

Figure 4A.--Percentage distribution of geological and geophysical permits by region or Gulf of Mexico planning area, 1960-1985

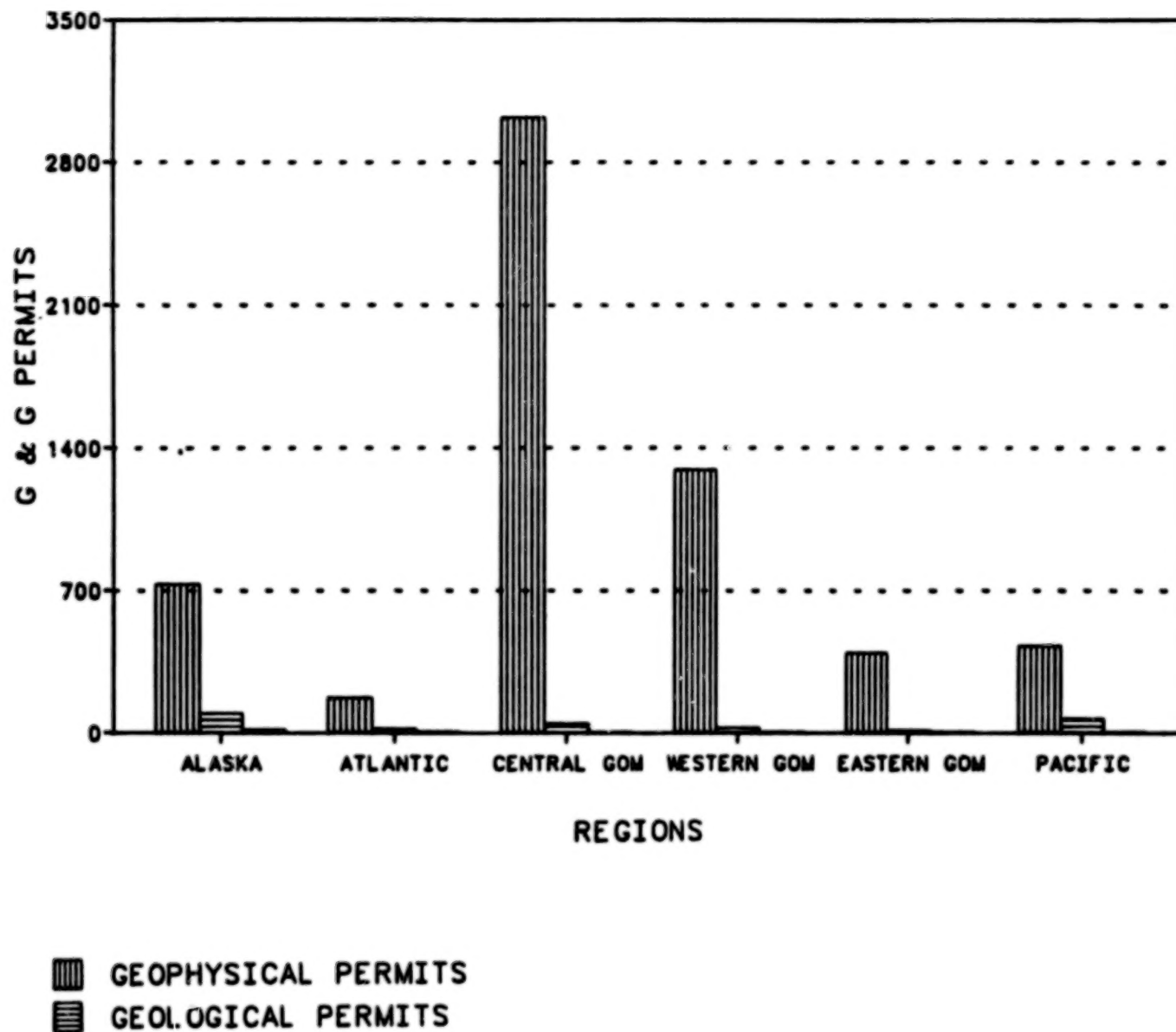


Figure 5A.--Geological and geophysical permits by region or Gulf of Mexico planning area and permit type, 1969-1985

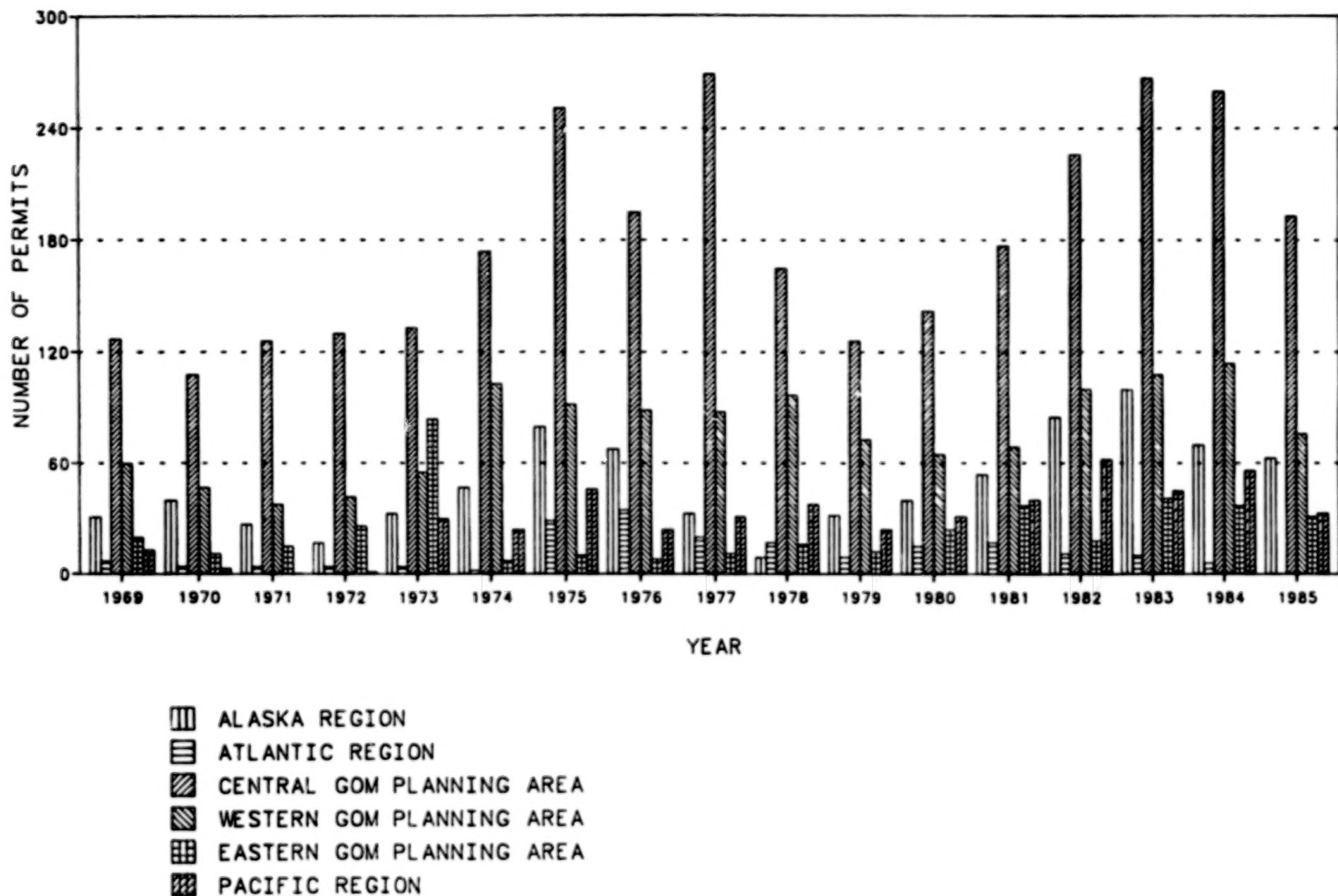


Figure 6A.--Geological and geophysical permits by CY year and region or Gulf of Mexico planning area, 1969-1985

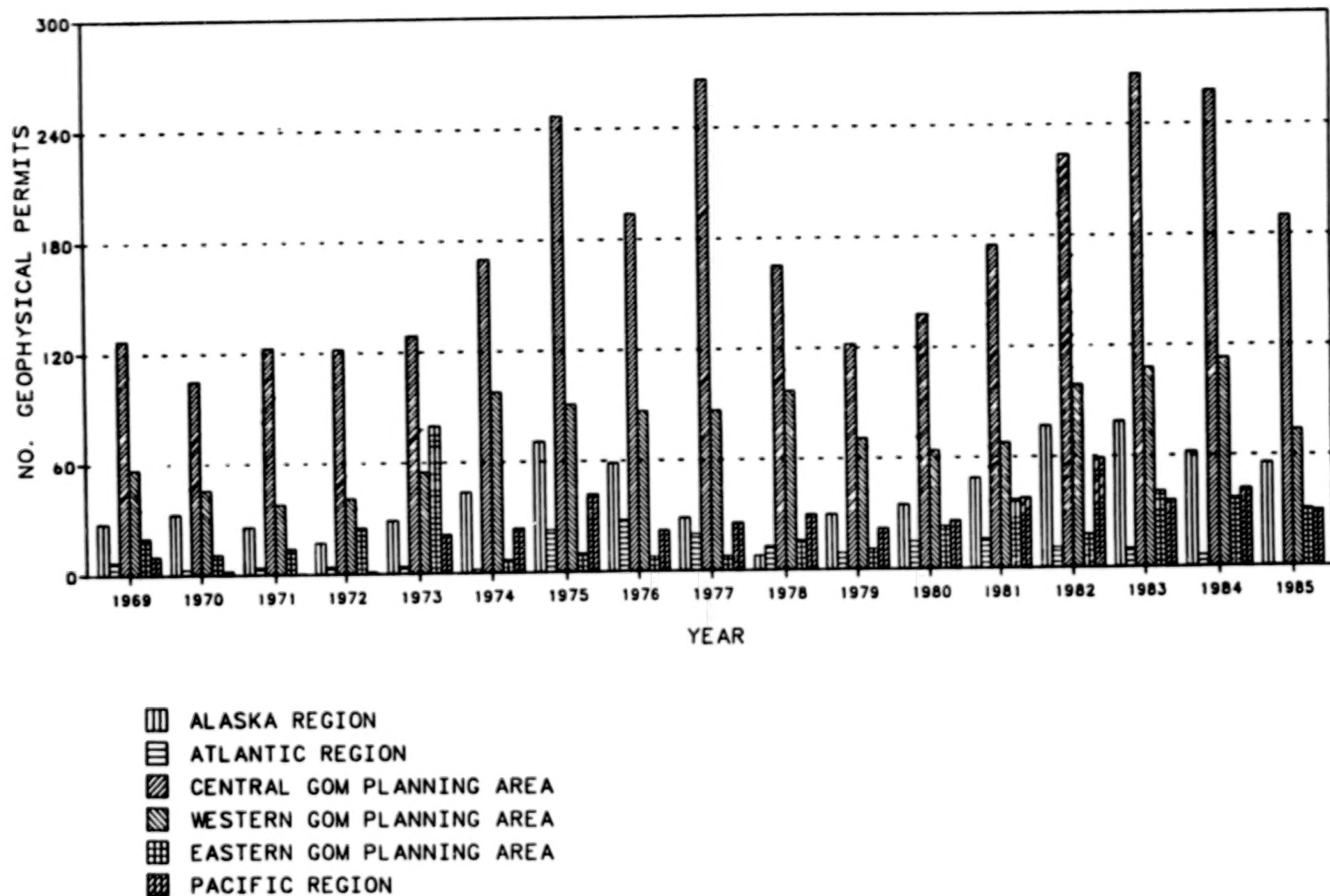
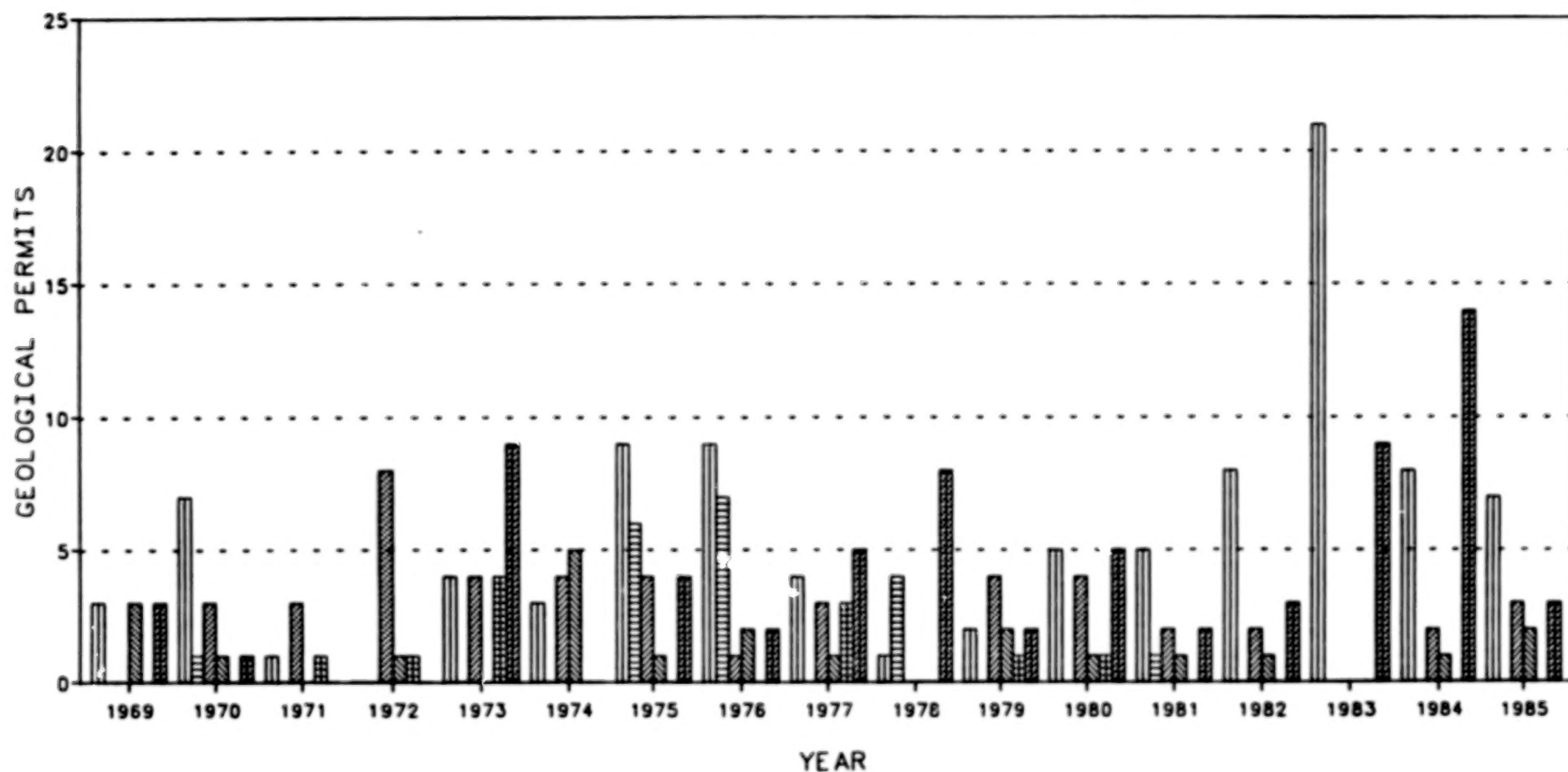


Figure 7A.--Geophysical permits by CY year and region or Gulf of Mexico planning area, 1969-1985



- ALASKA REGION
- ATLANTIC REGION
- CENTRAL GOM PLANNING AREA
- WESTERN GOM PLANNING AREA
- EASTERN GOM PLANNING AREA
- PACIFIC REGION

Figure 8A.--Geological permits by CY year and region or Gulf of Mexico planning area, 1969-1985

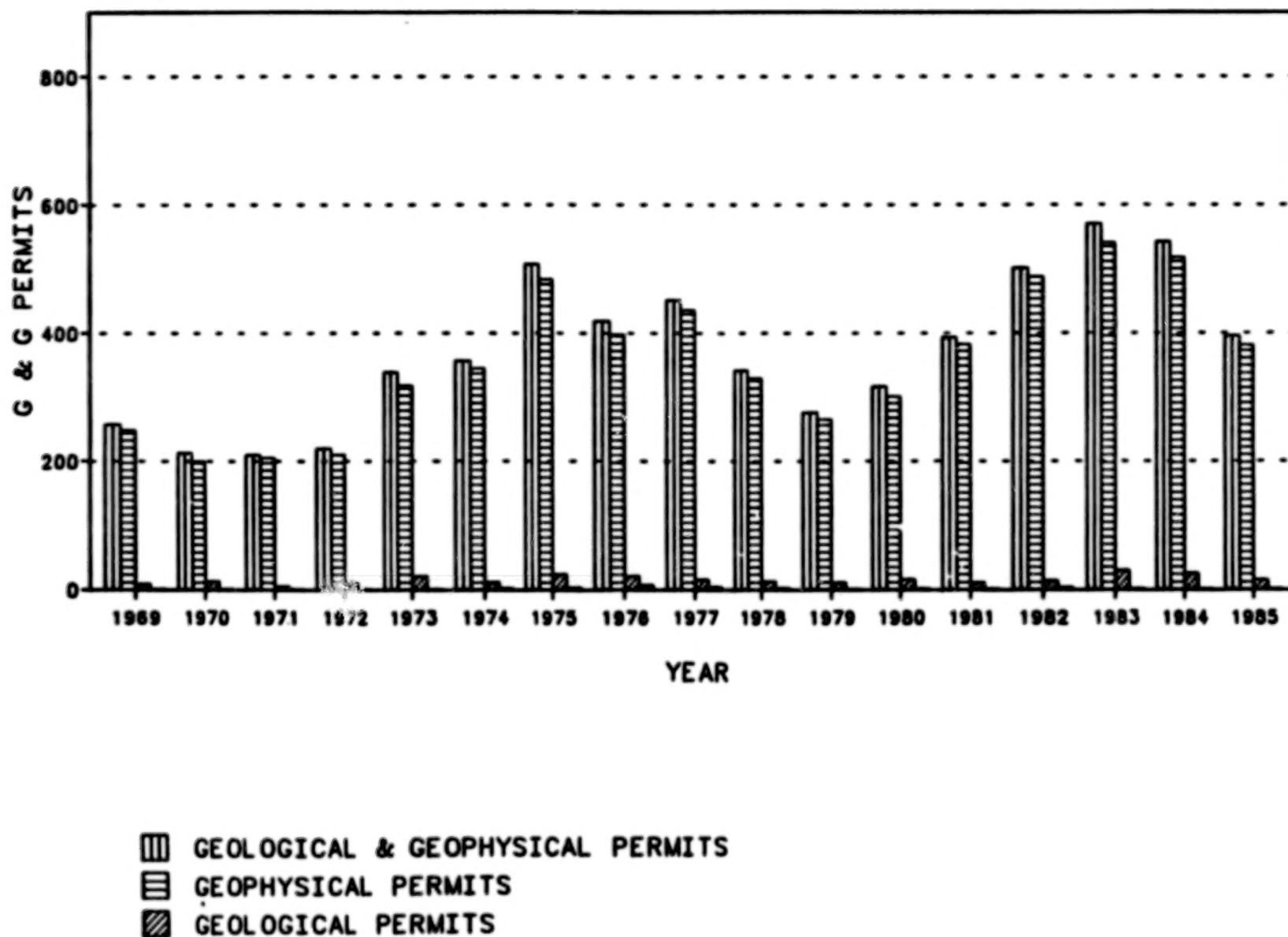


Figure 9A.--Geological and geophysical permits by CY year and type, 1969-1985

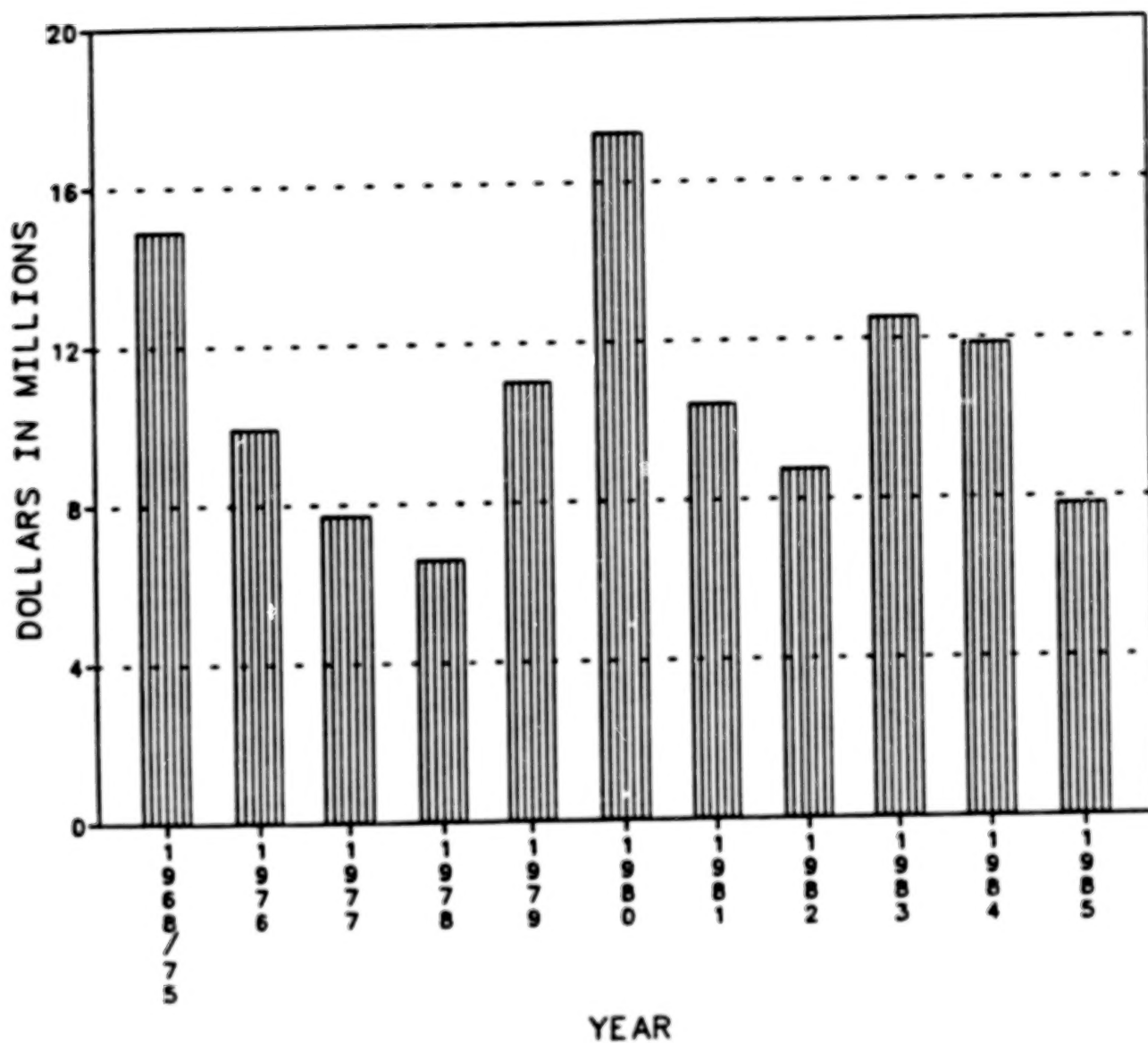
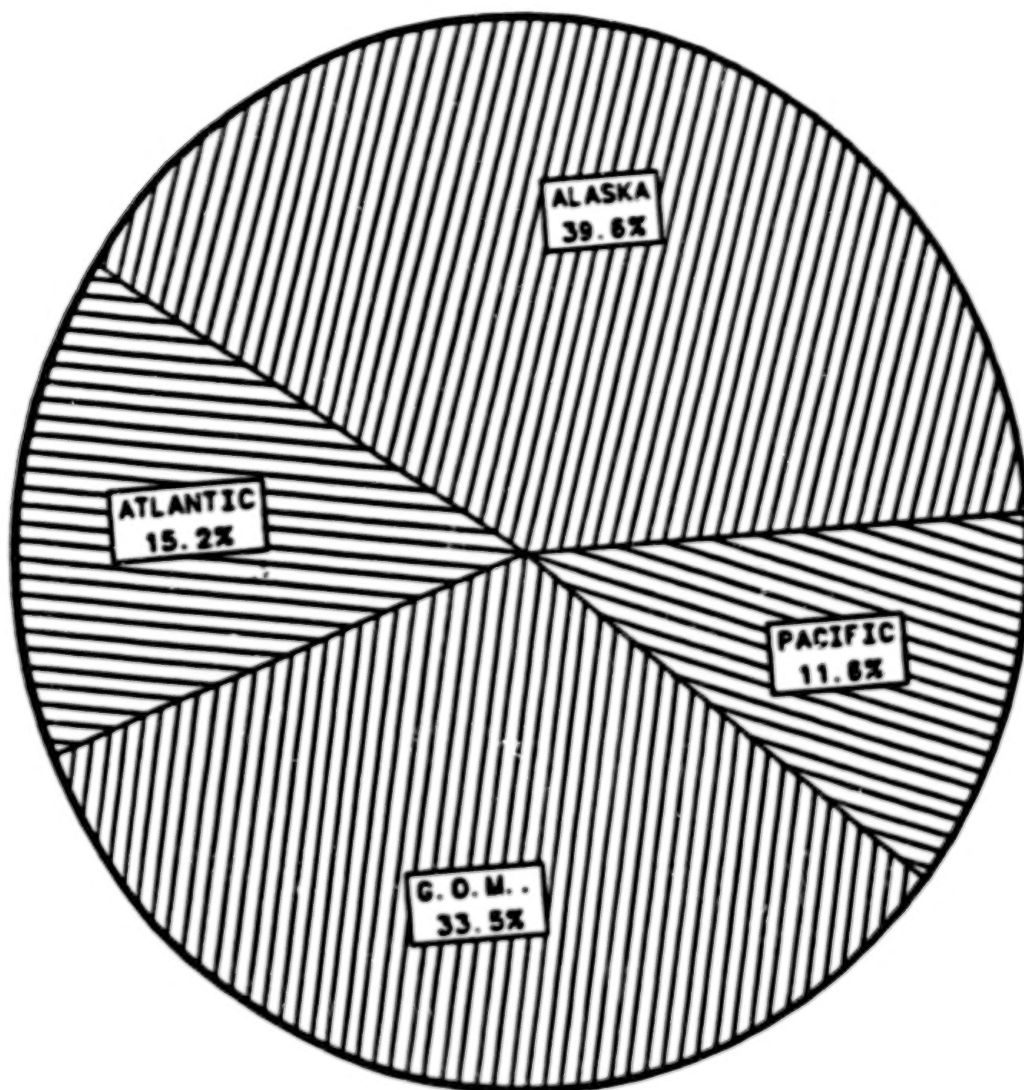


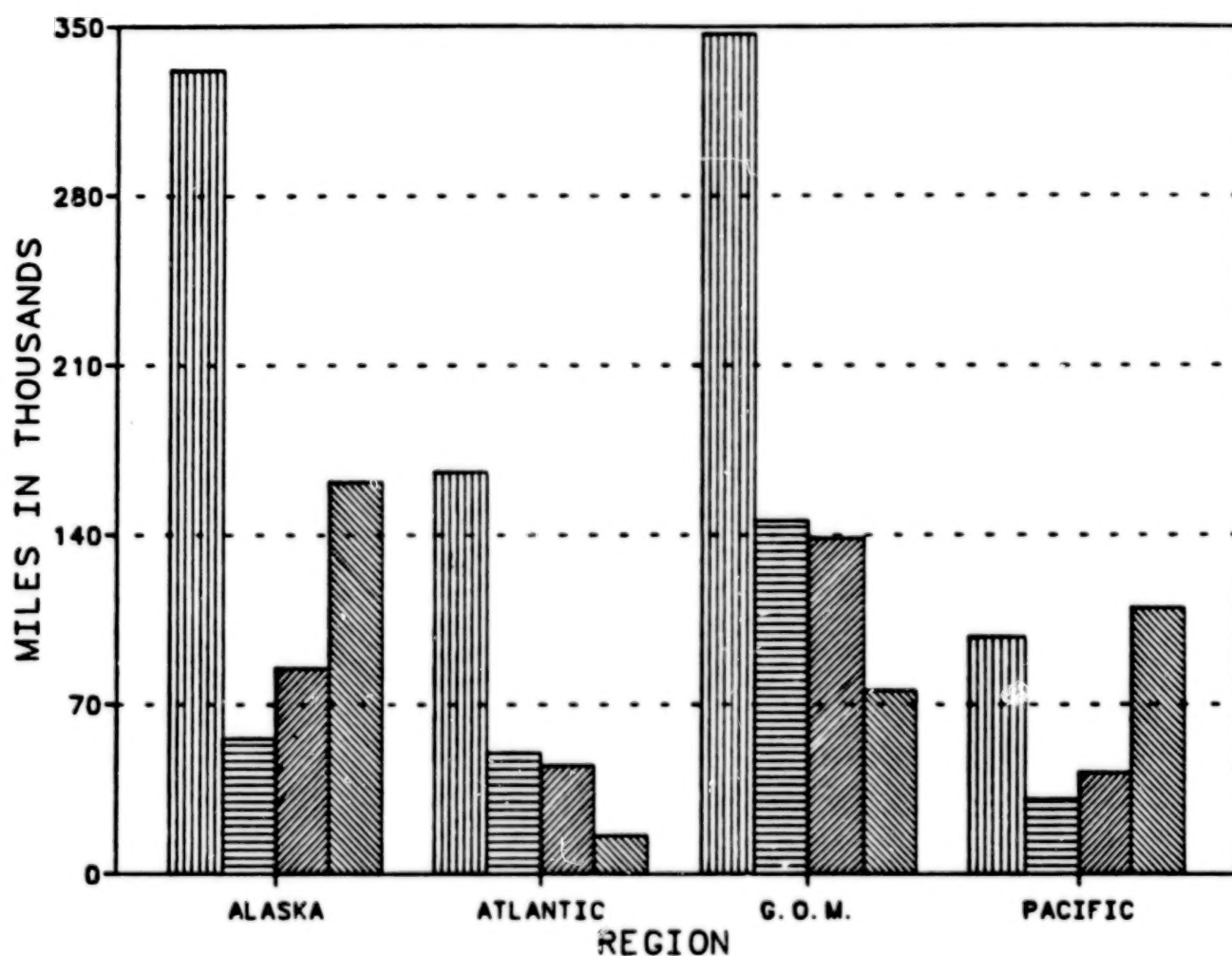
Figure 10A.--Total expenditures for geological and geophysical data acquisition by year, FY 1968-1985



REGION	EXPENDITURES
ALASKA	\$ 46,552,106
ATLANTIC	\$ 17,875,485
GULF OF MEXICO	\$ 39,384,333
PACIFIC	\$ 13,598,365
TOTAL	\$117,410,289 *

* DOES NOT INCLUDE FUNDS TRANSFERRED TO USGS

Figure 11A.--Percentage distribution of expenditures for geological and geophysical data acquisition by region, FY 1968-1985



- ▤ COMMON DEPTH POINT SEISMIC DATA
- ▥ HIGH RESOLUTION SEISMIC DATA
- ▧ COMMON DEPTH POINT INTERPRETATIONS
- ▨ GRAVITY & MAGNETIC DATA

Figure 12A.--Miles of geophysical data by region and data type, FY 1968-1985

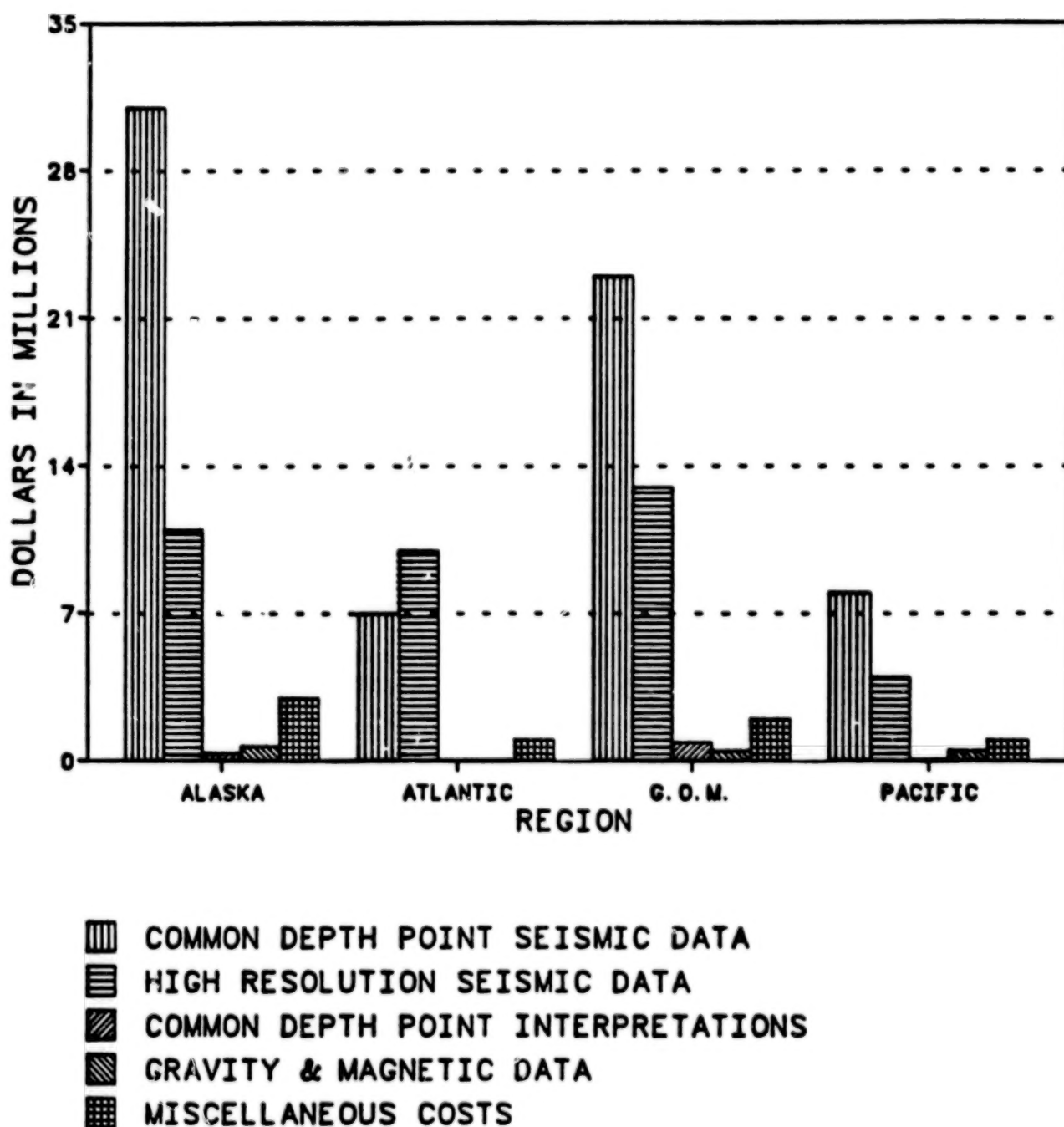
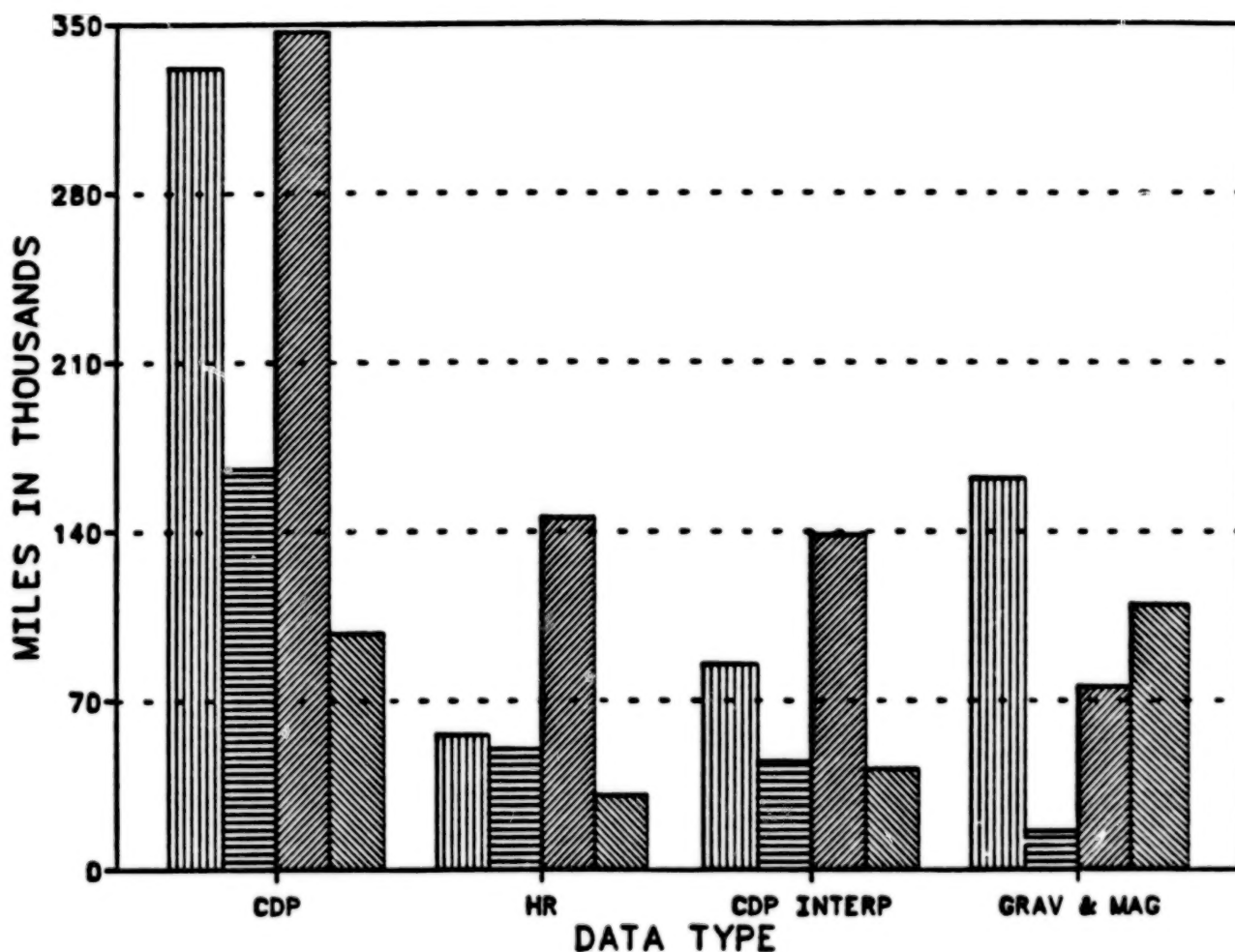


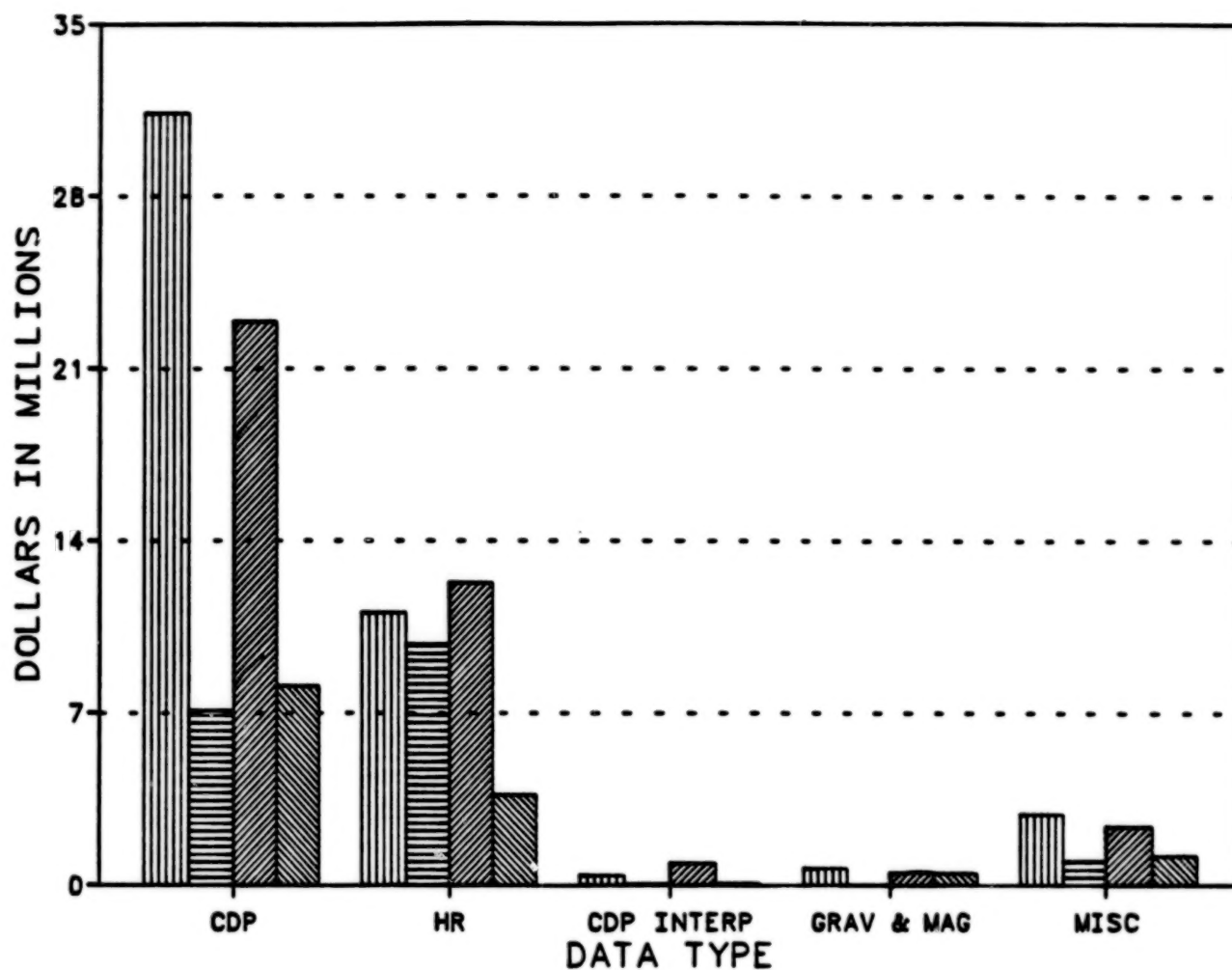
Figure 13A.--Expenditures for geophysical data by region and data type, FY 1968-1985



- ALASKA REGION
- ATLANTIC REGION
- GULF OF MEXICO REGION
- PACIFIC REGION

CDP - COMMON DEPTH POINT SEISMIC REFLECTION
 HR - HIGH RESOLUTION SEISMIC REFLECTION
 CDP INTERP - COMMON DEPTH POINT INTERPRETATIONS
 GRAV & MAG - GRAVITY AND MAGNETICS

Figure 14A.--Miles of geophysical data by data type and region, FY 1968-1985



- ▤ ALASKA REGION
- ▥ ATLANTIC REGION
- ▧ GULF OF MEXICO REGION
- ▨ PACIFIC REGION

CDP - COMMON DEPTH POINT SEISMIC REFLECTION
 HR - HIGH RESOLUTION SEISMIC REFLECTION
 CDP INTERP - COMMON DEPTH POINT INTERPRETATIONS
 GRAV & MAG - GRAVITY AND MAGNETICS
 MISC - MISCELLANEOUS

Figure 15A.--Expenditures for geophysical data by data type and region, FY 1968-1985

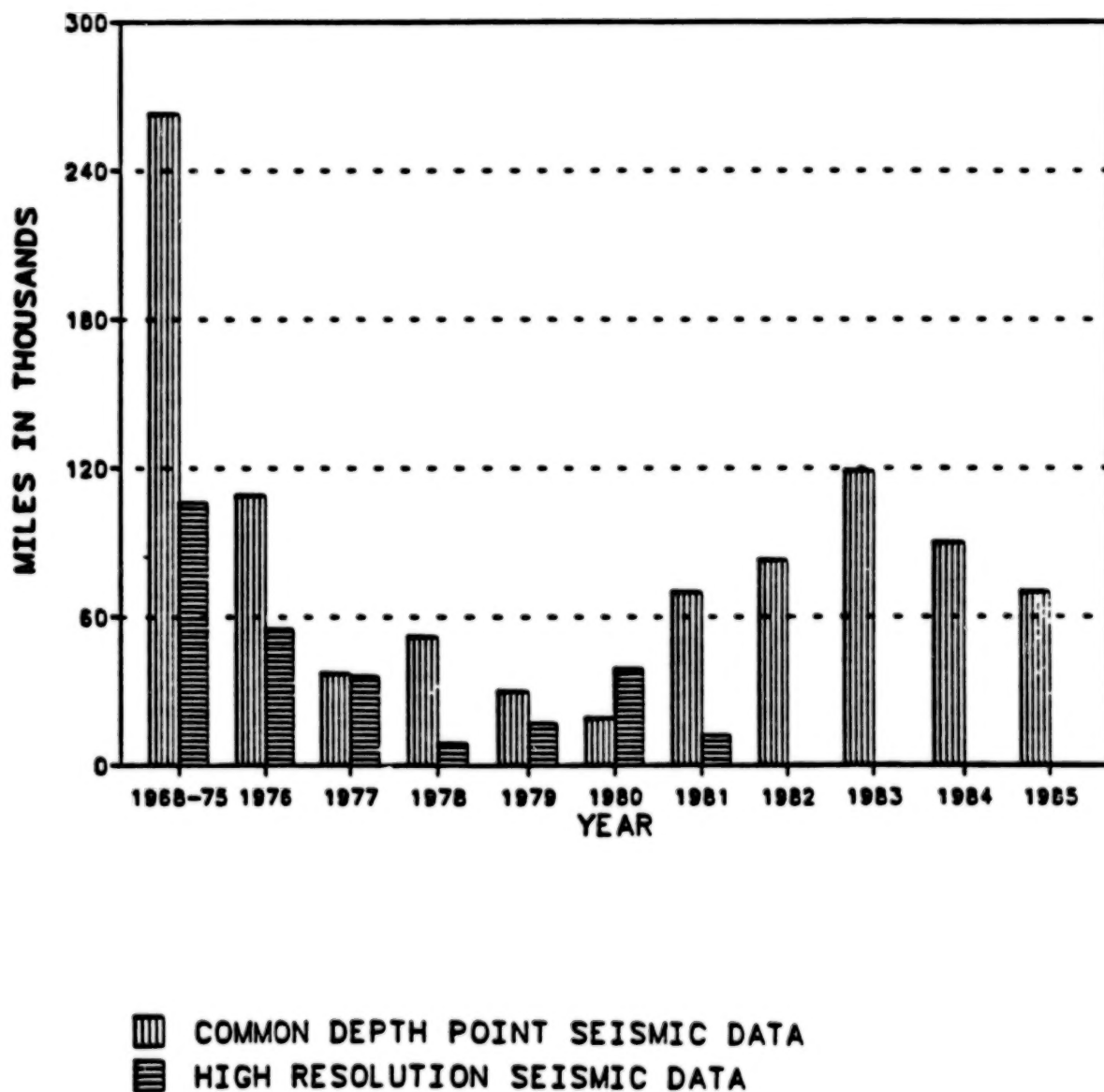


Figure 16A.--Miles of common depth point and high-resolution seismic data by year, FY 1968-1985

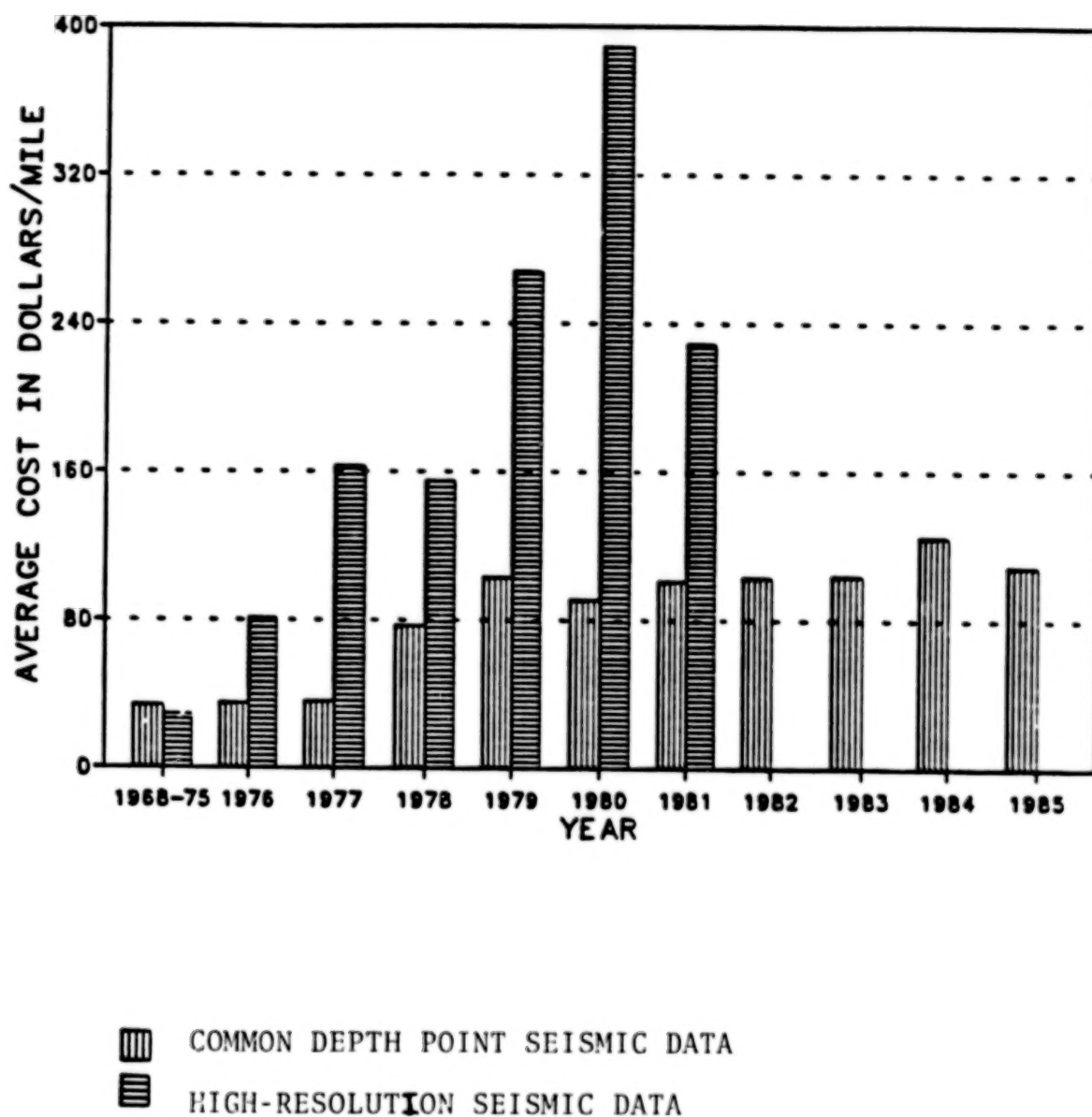


Figure 17A.--Average cost per mile of common depth point and high-resolution seismic data by year, FY 1968-1985

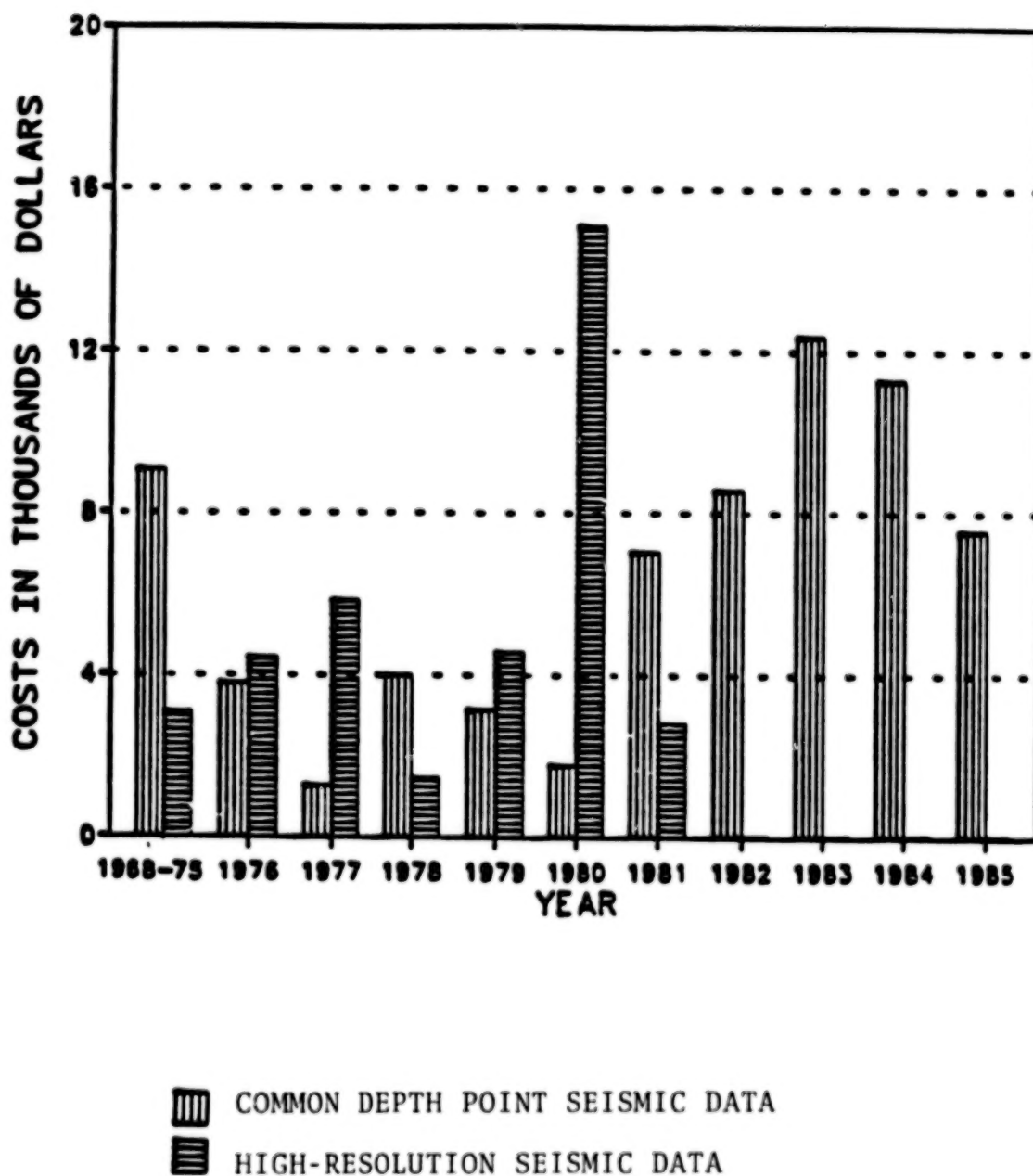


Figure 18A.--Total cost for common depth point and high-resolution seismic data by year, FY 1968-1985

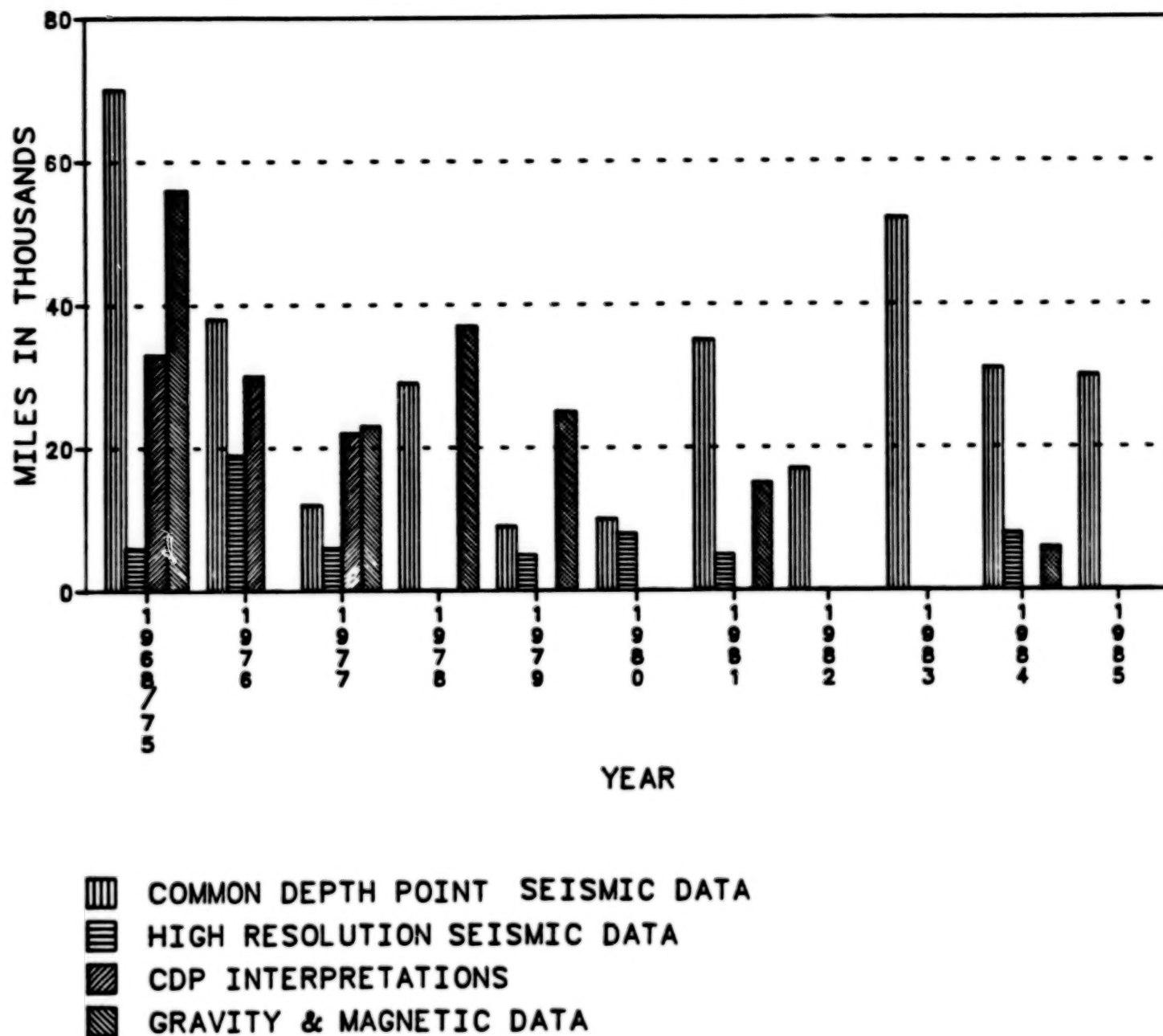
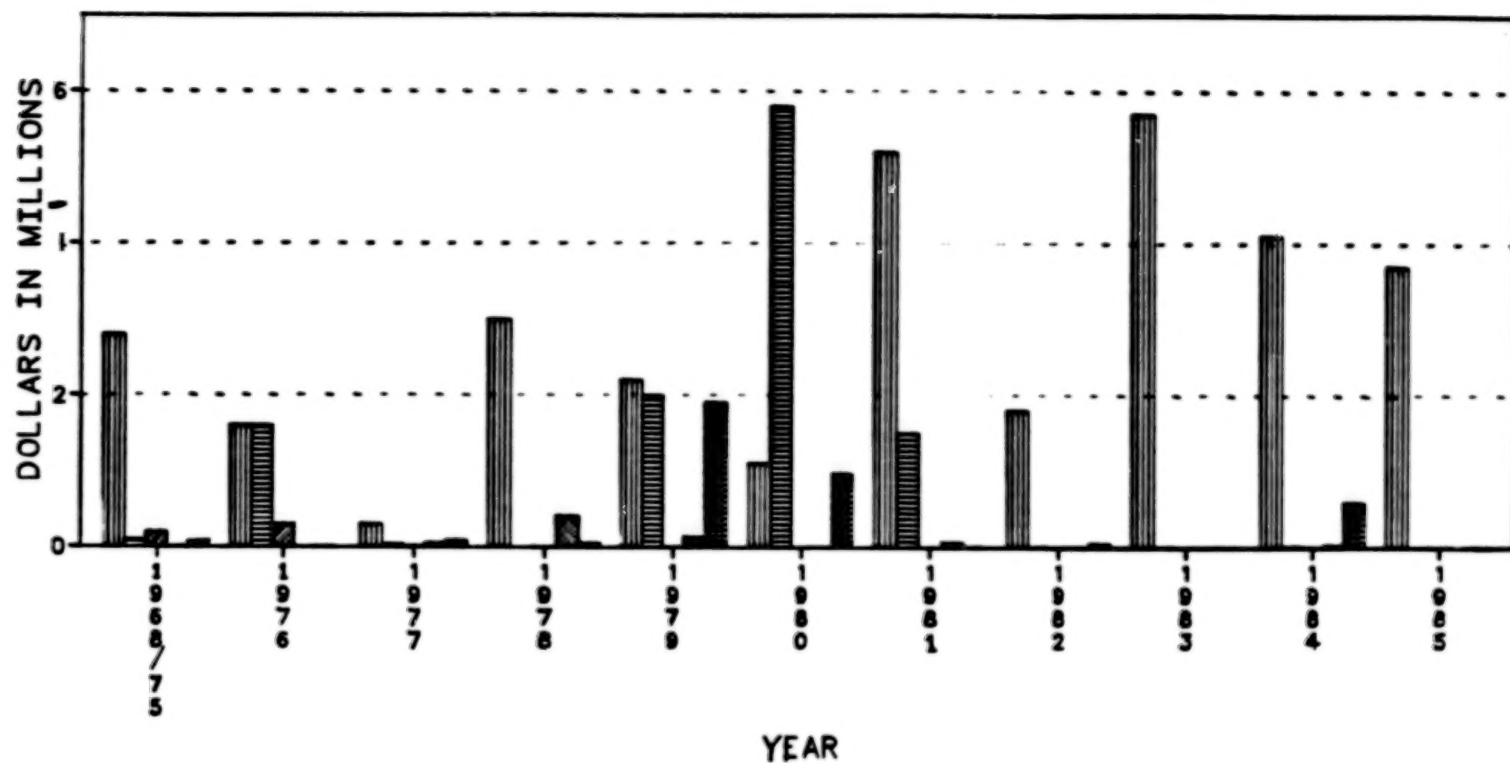


Figure 19A.--Miles of geophysical data for Alaska Region by year and data type, FY 1968-1985



- COMMON DEPTH POINT SEISMIC DATA
- HIGH RESOLUTION SEISMIC DATA
- CDP INTERPRETATIONS
- GRAVITY & MAGNETIC DATA
- MISCELLANEOUS

Figure 20A.--Cost of geological and geophysical data for Alaska Region by year and data type, FY 1968-1985

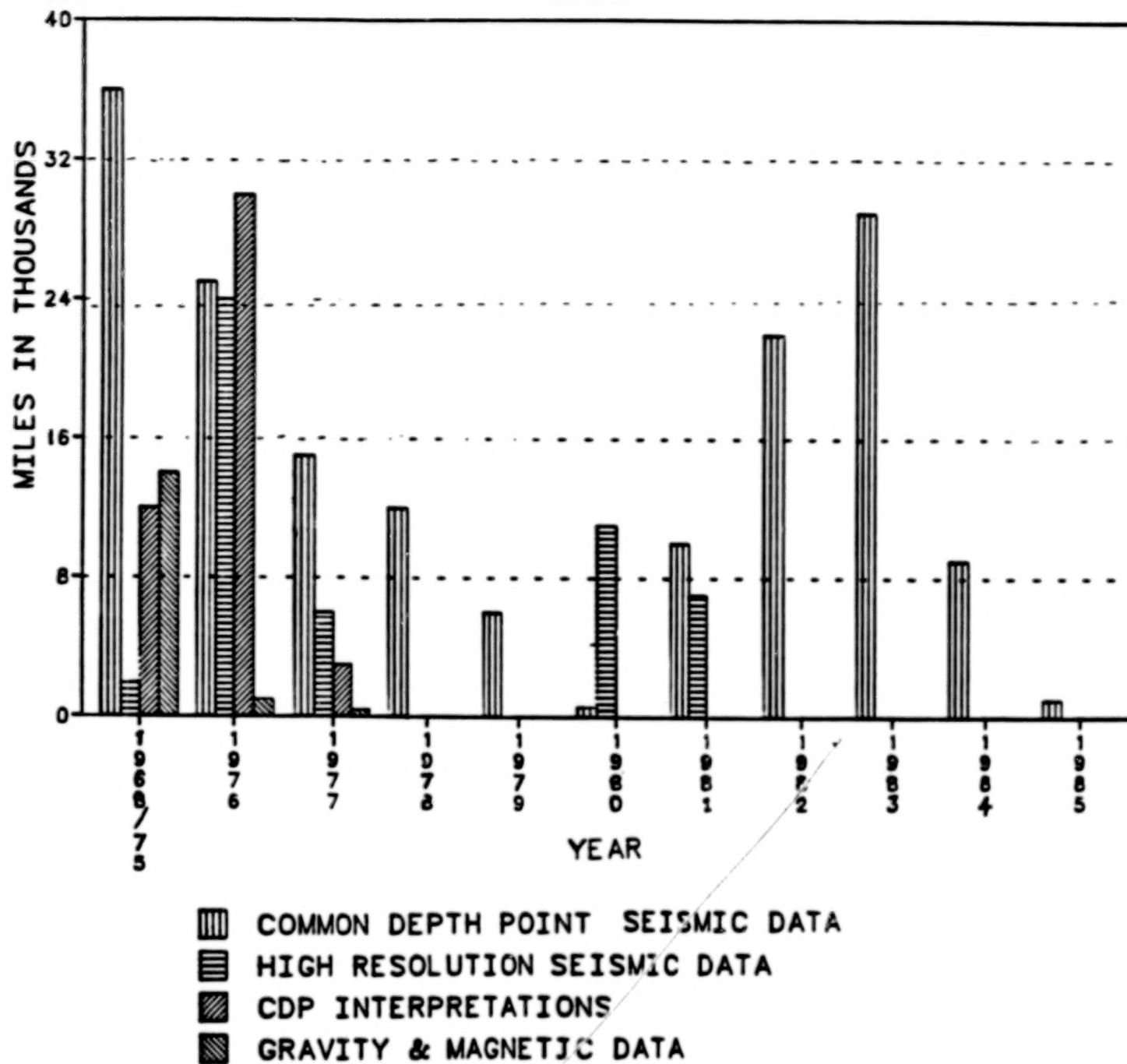


Figure 21A.--Miles of geophysical data for Atlantic Region
by year and data type, FY 1968-1985

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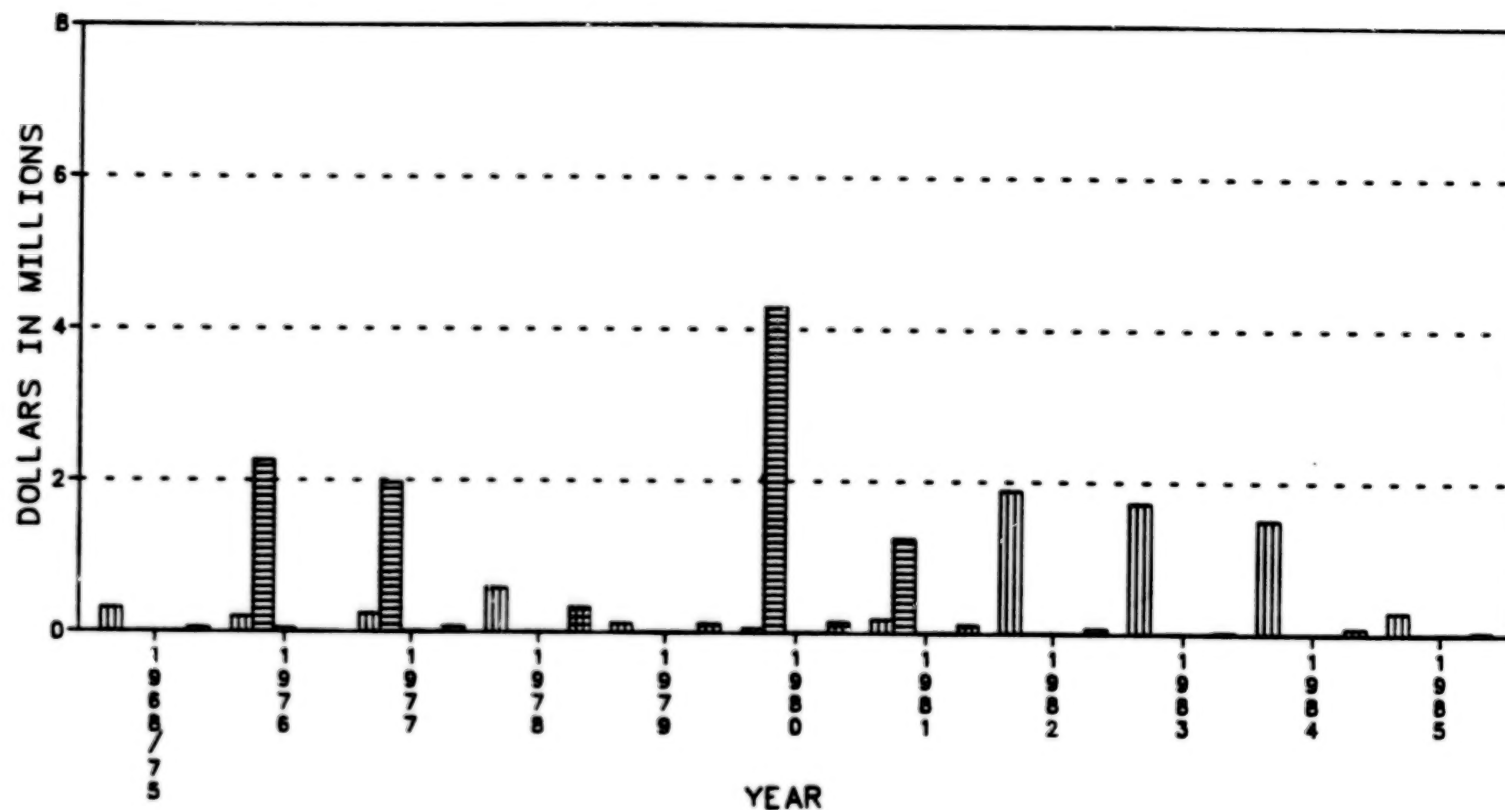


Figure 22A.--Cost of geological and geophysical data for Atlantic Region by year and data type, FY 1968-1985

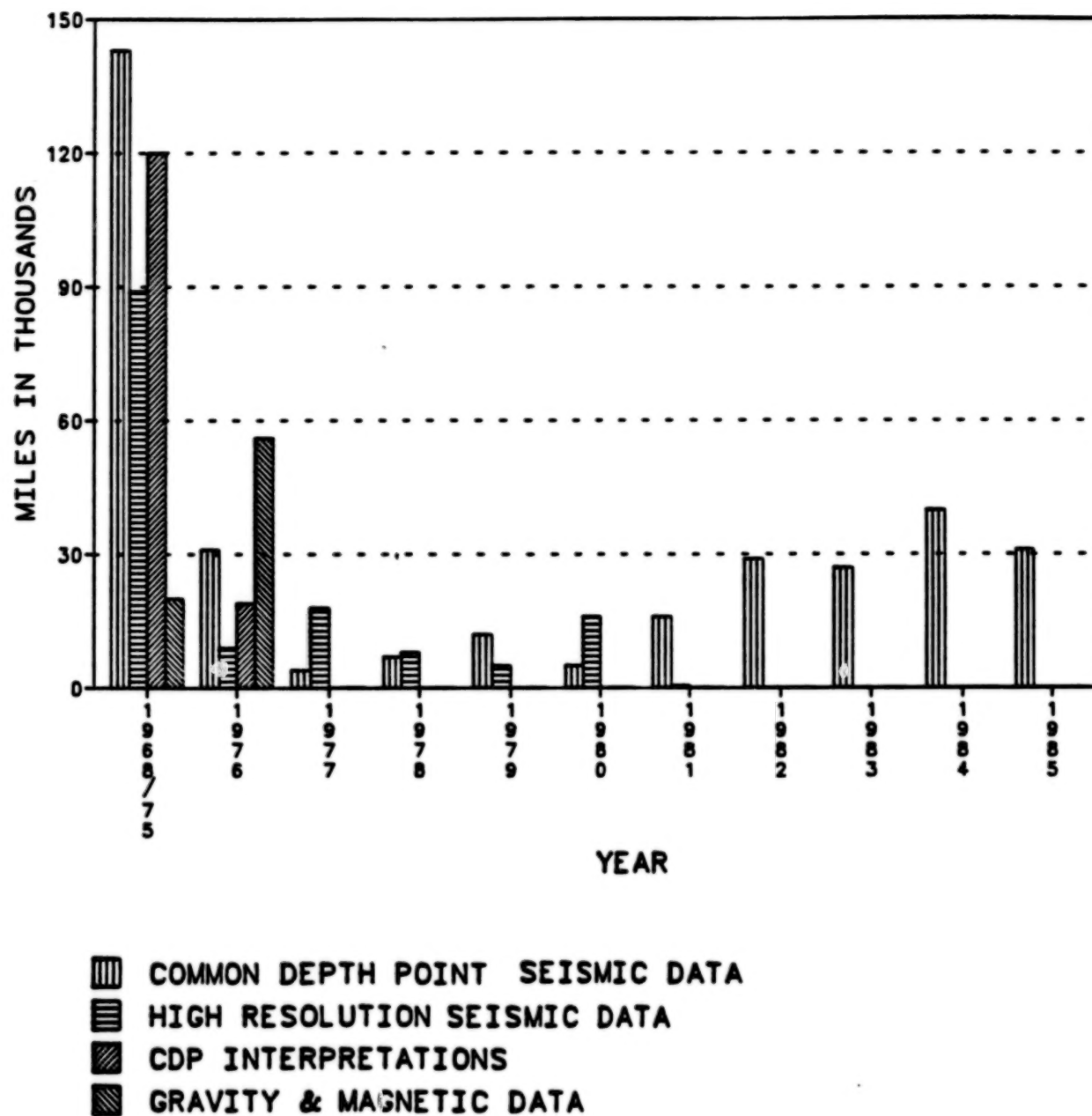


Figure 23A.--Miles of geophysical data for Gulf of Mexico Region
by year and data type, FY 1968-1985

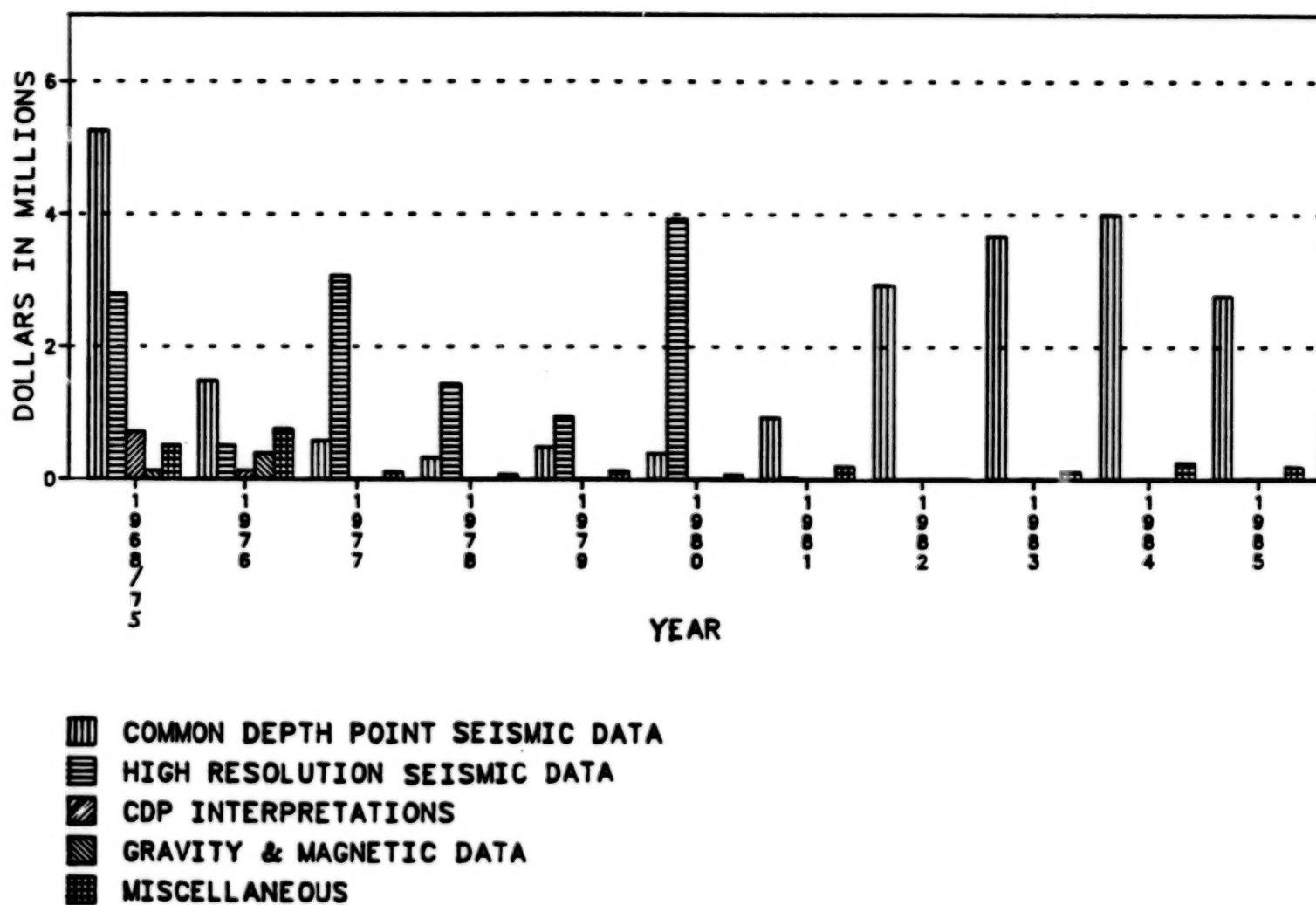
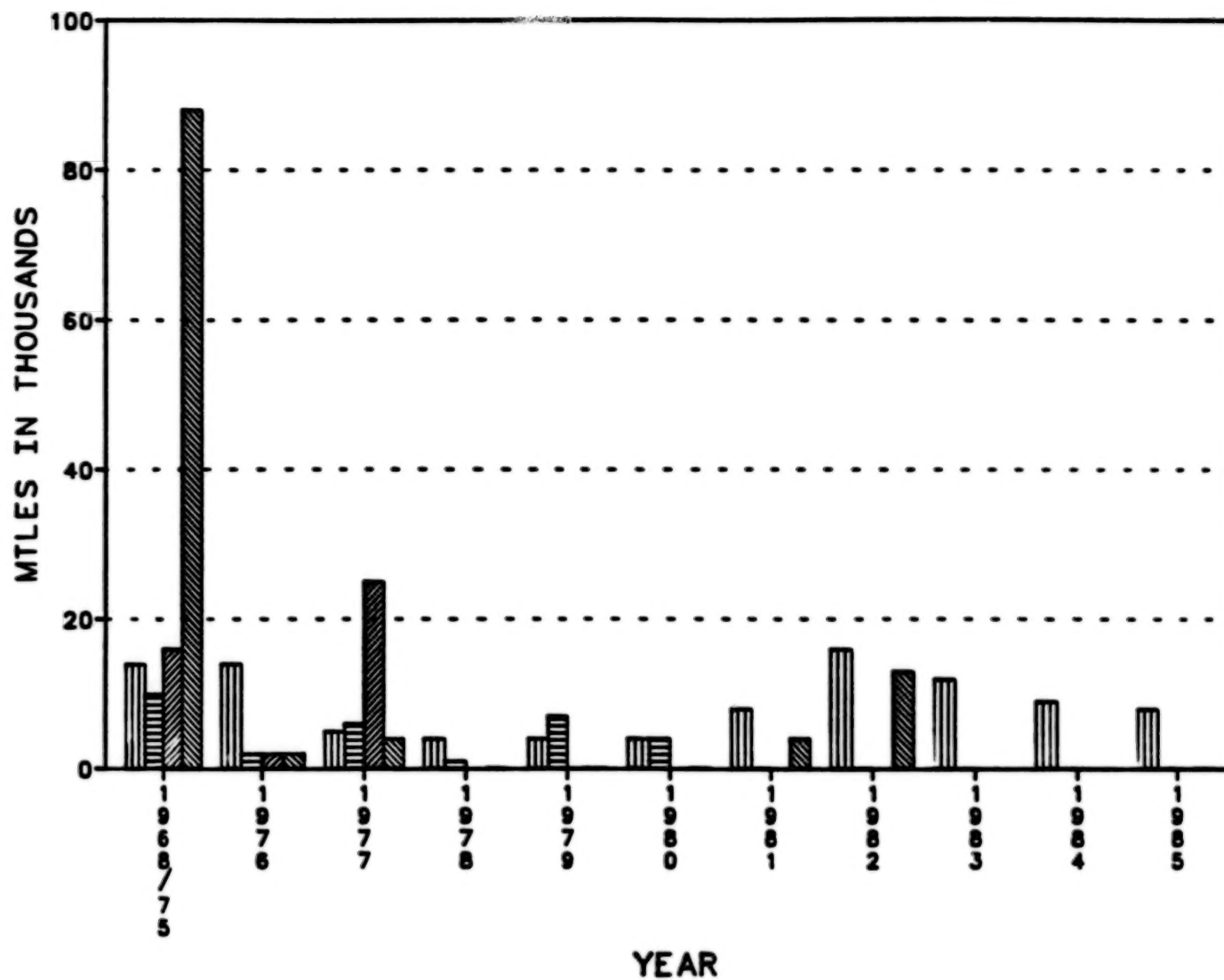
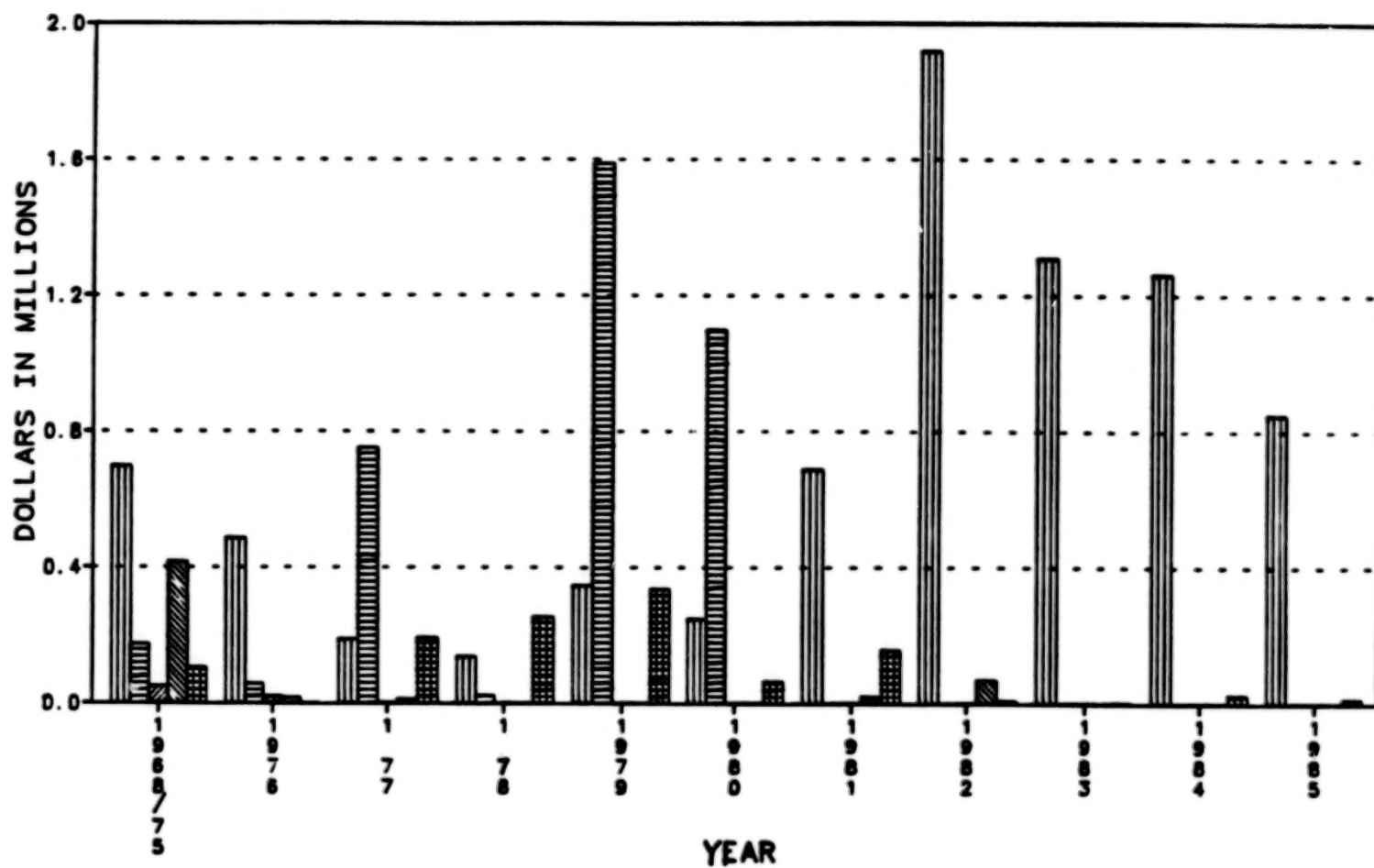


Figure 24A.--Cost of geological and geophysical data for Gulf of Mexico Region by year and data type, FY 1968-1985



- COMMON DEPTH POINT SEISMIC DATA
- HIGH RESOLUTION SEISMIC DATA
- CDP INTERPRETATIONS
- GRAVITY & MAGNETIC DATA

Figure 25A.—Miles of geophysical data for Pacific Region
by year and data type, FY 1968-1985



- COMMON DEPTH POINT SEISMIC DATA
- HIGH RESOLUTION SEISMIC DATA
- CDP INTERPRETATIONS
- GRAVITY & MAGNETIC DATA
- MISCELLANEOUS

Figure 26A.--Cost of geological and geophysical data for Pacific Region by year and data type, FY 1968-1985

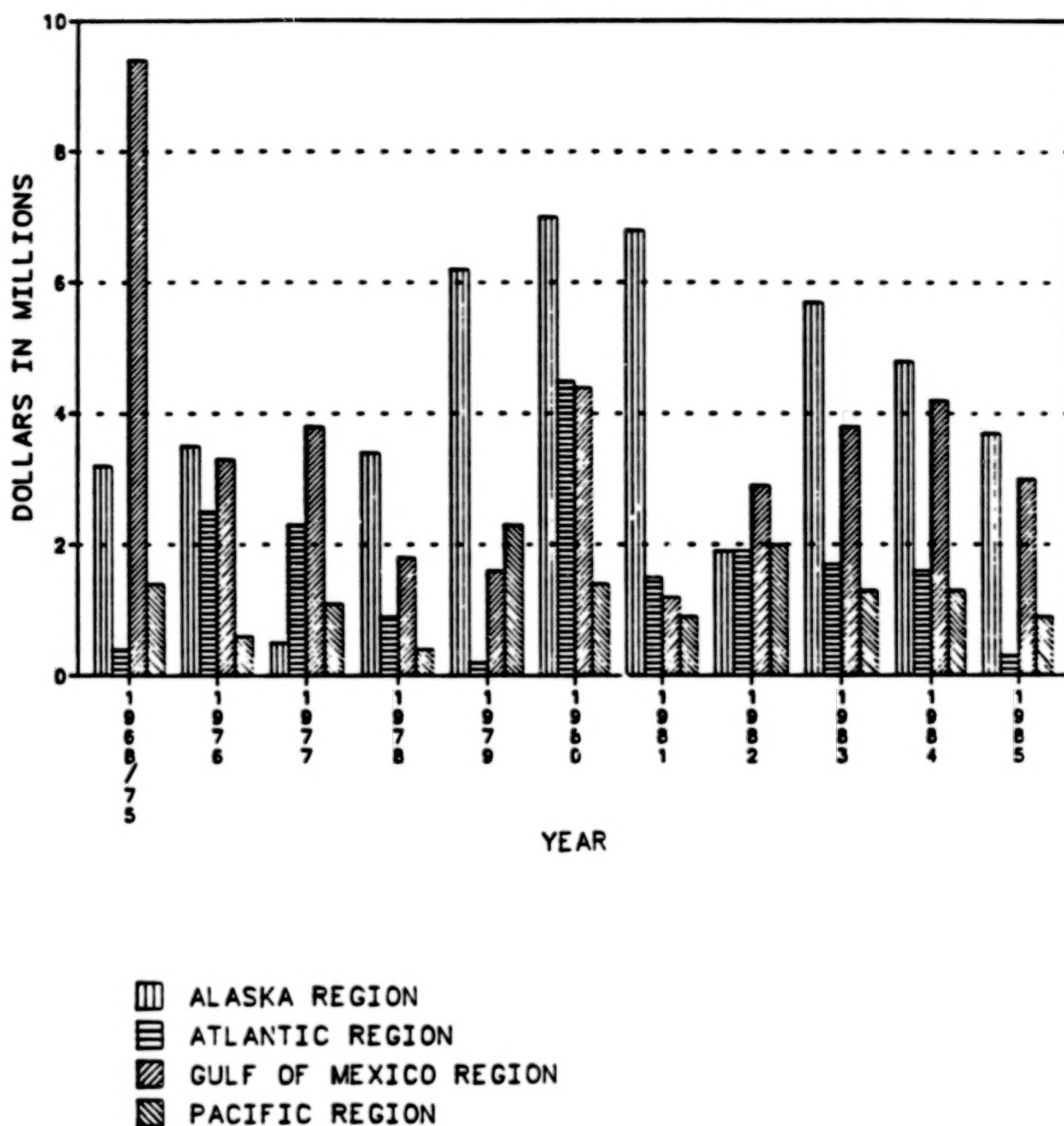


Figure 27A.--Comparison of expenditures for geological and geophysical data acquisition by year and region, FY 1968-1985

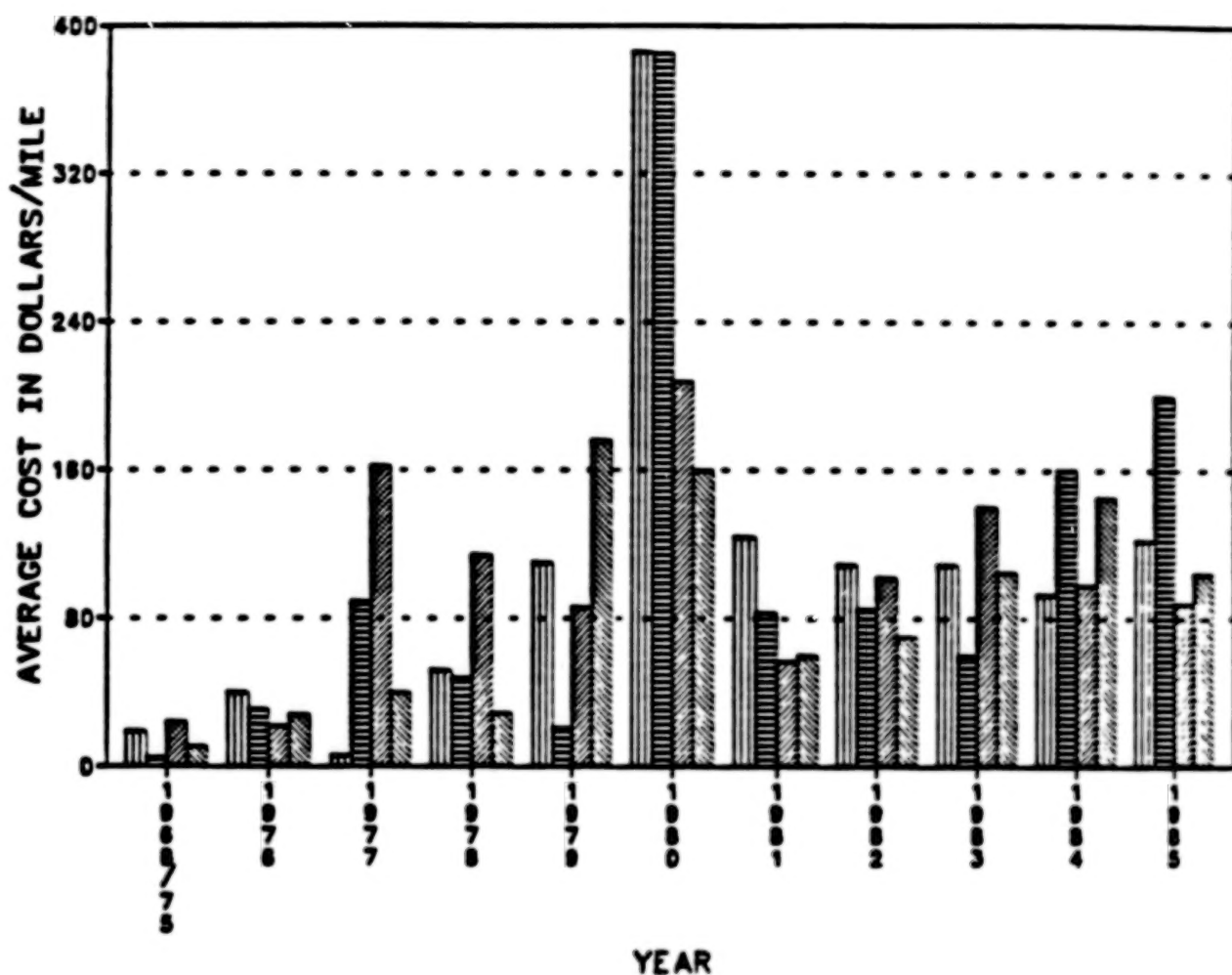


Figure 28A.--Average cost per mile of geophysical data
by year and region, FY 1968-1985

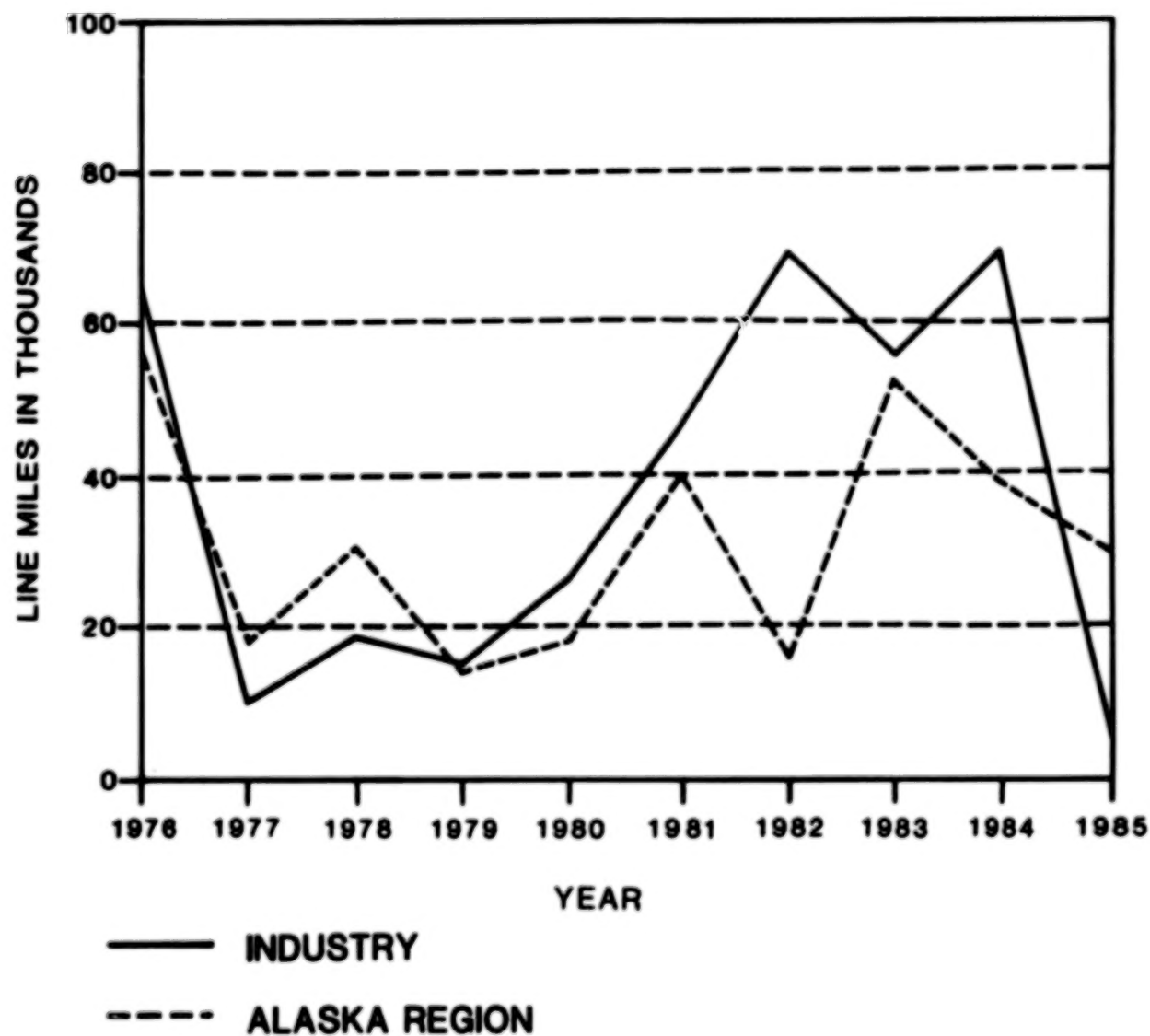


Figure 29A.--Comparison of miles of seismic data acquisition for Alaska Region and industry by year, 1976-1985

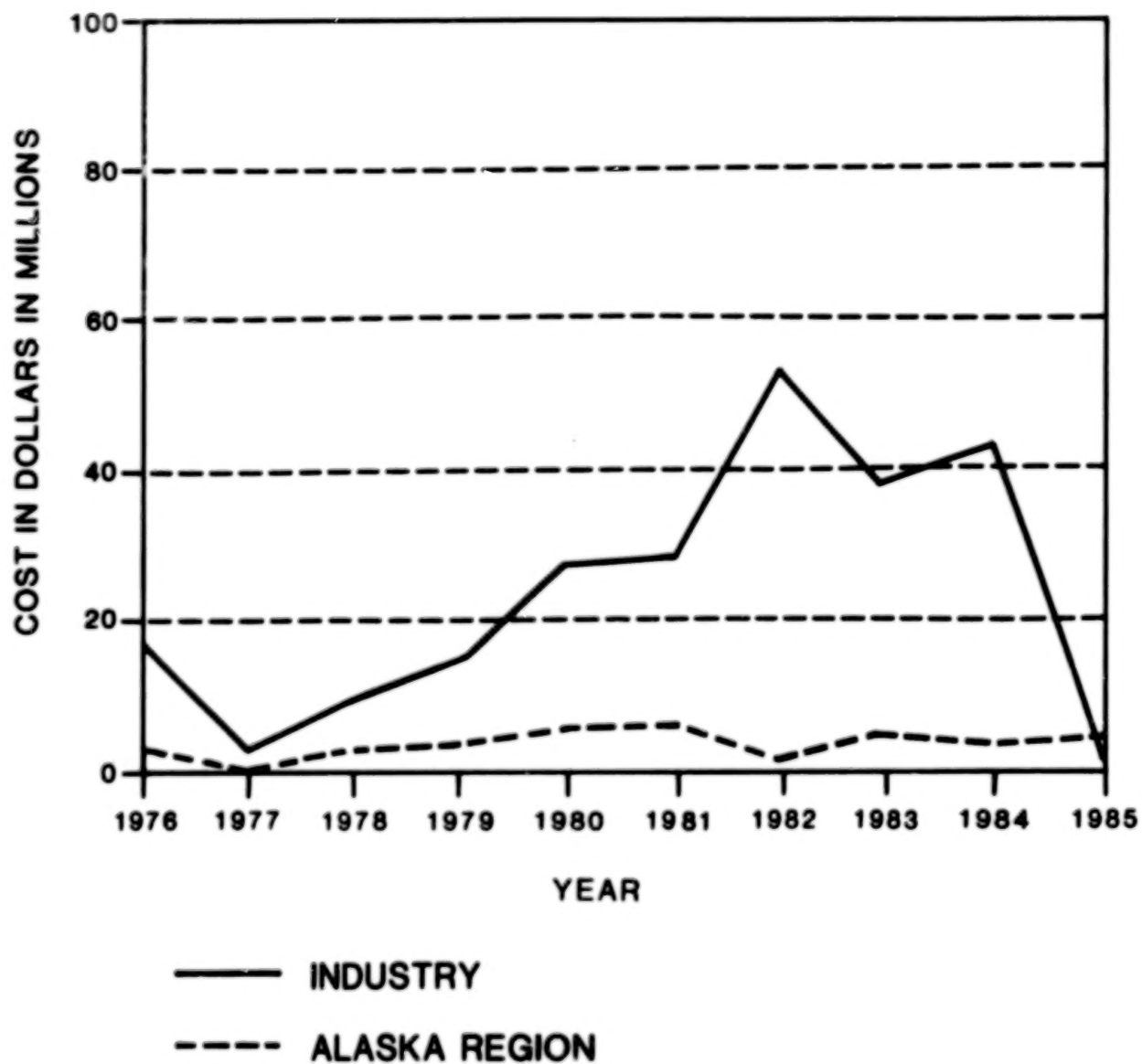


Figure 30A.--Comparison of expenditures for seismic data acquisition for Alaska Region and industry by year, 1976-1985

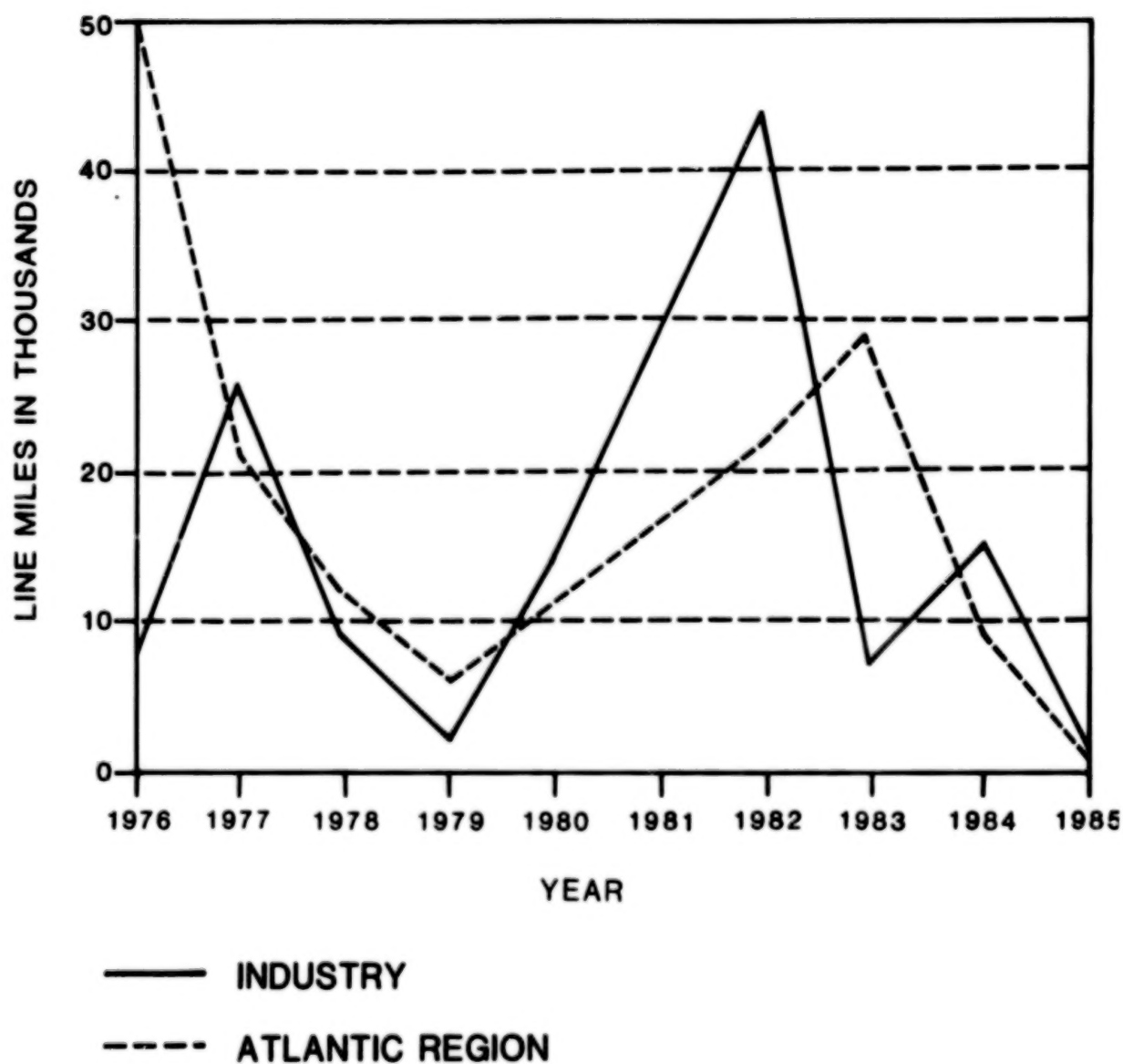


Figure 31A.--Comparison of miles of seismic data acquisition for Atlantic Region and industry by year, 1976-1985

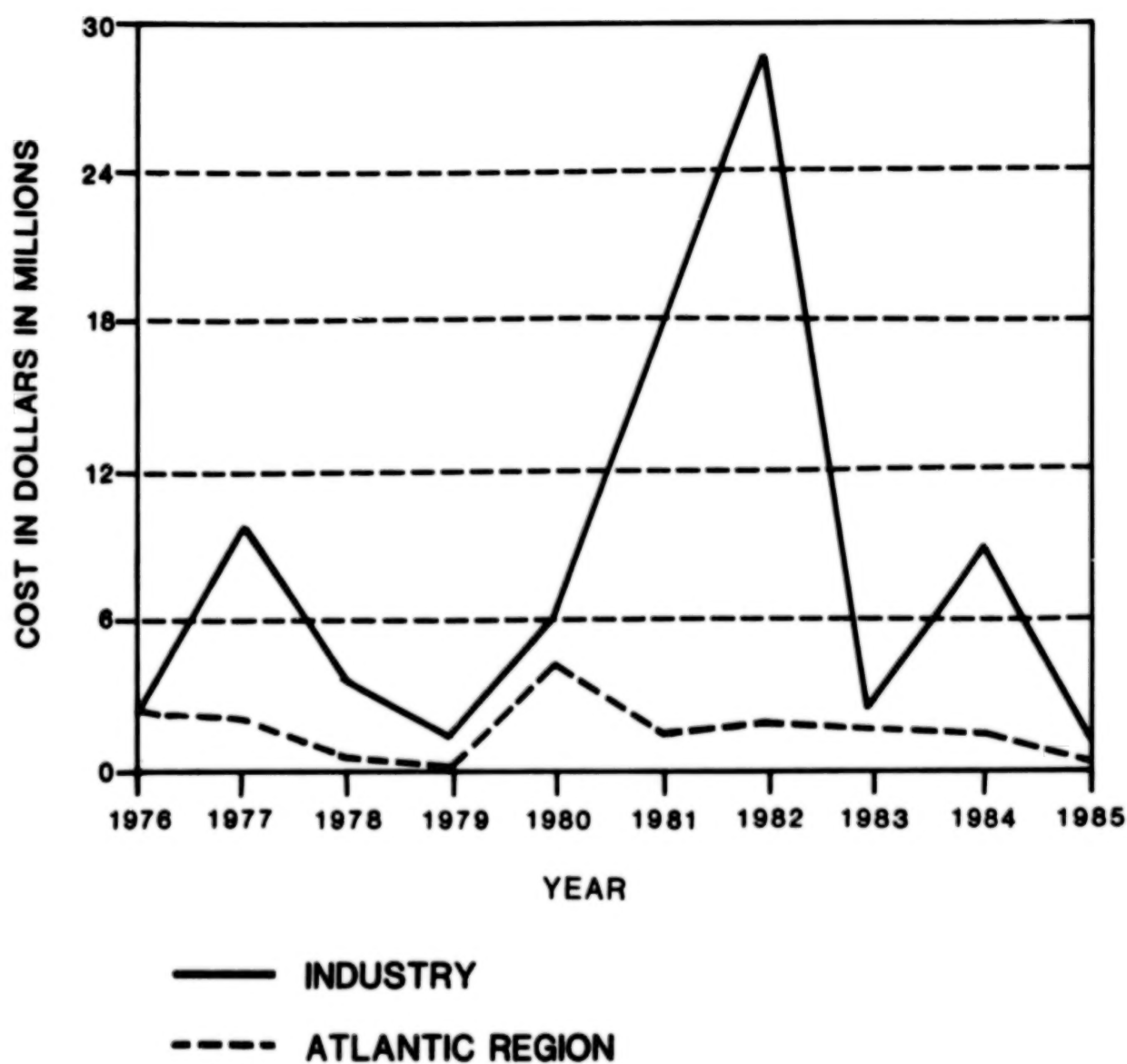


Figure 32A.--Comparison of expenditures for seismic data acquisition for Atlantic Region and industry by year, 1976-1985

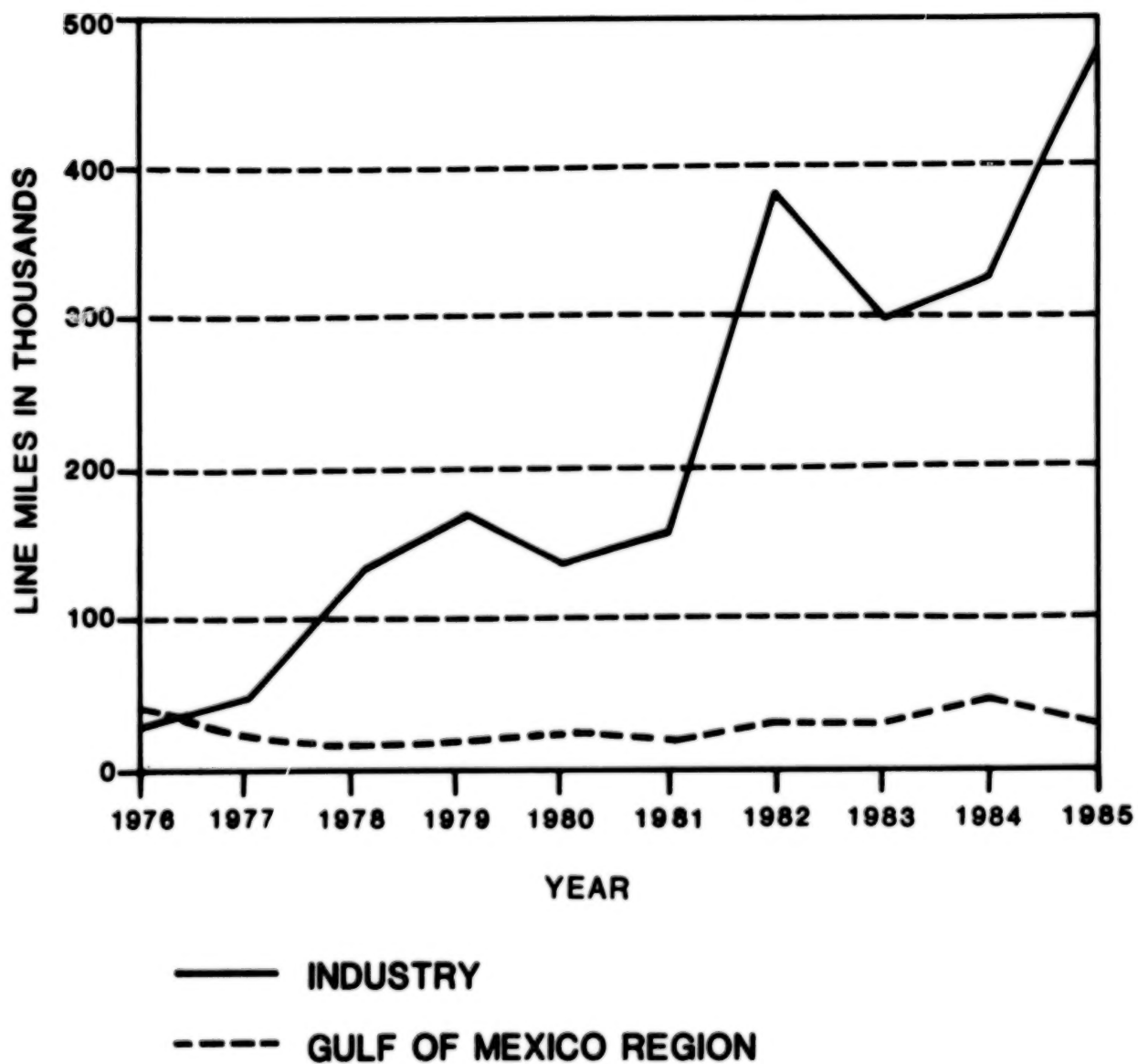


Figure 33A.--Comparison of miles of seismic data acquisition for Gulf of Mexico Region and industry by year, 1976-1985

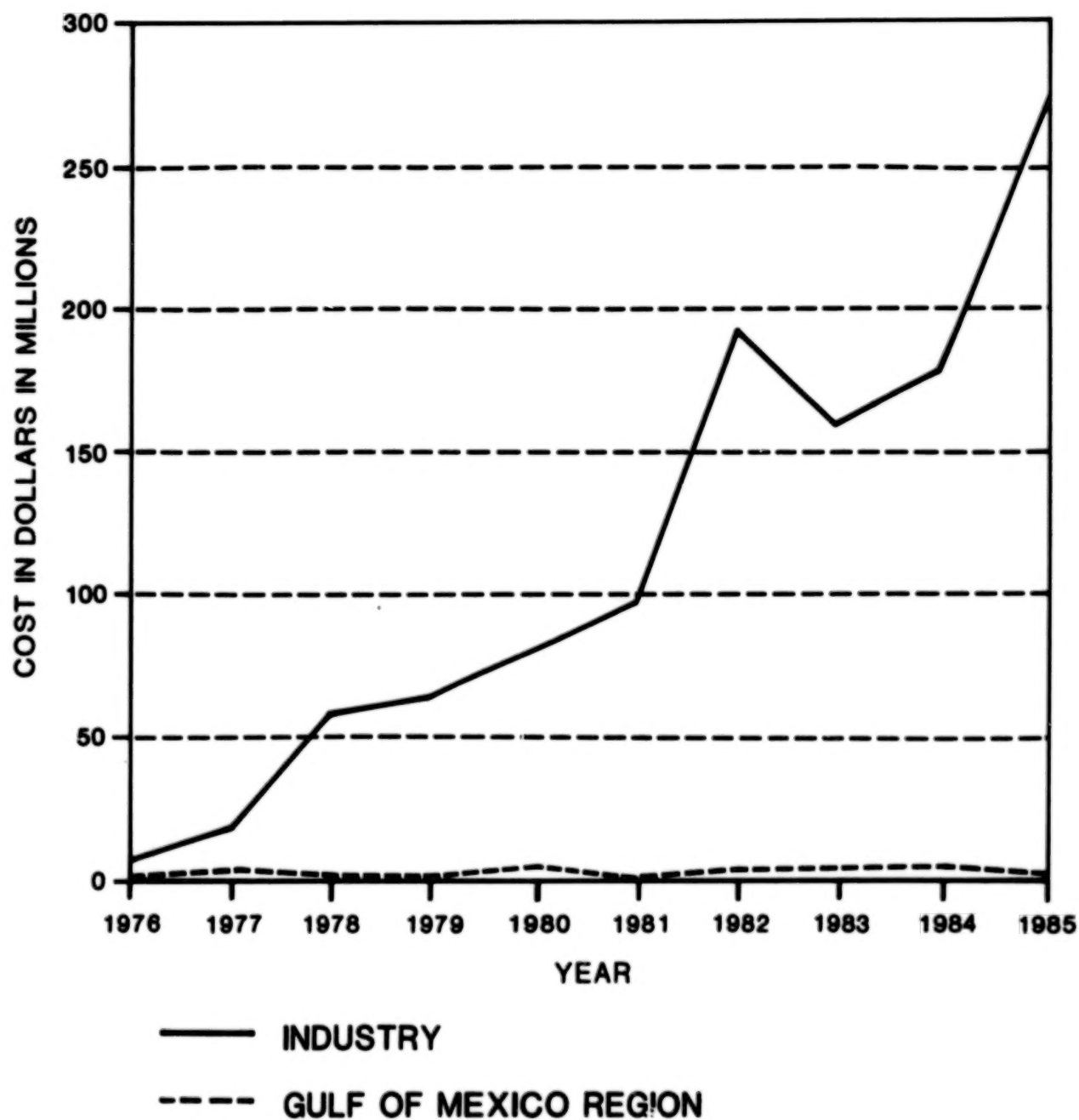


Figure 34A.--Comparison of expenditures for seismic data acquisition for Gulf of Mexico and industry by year, 1976-1985

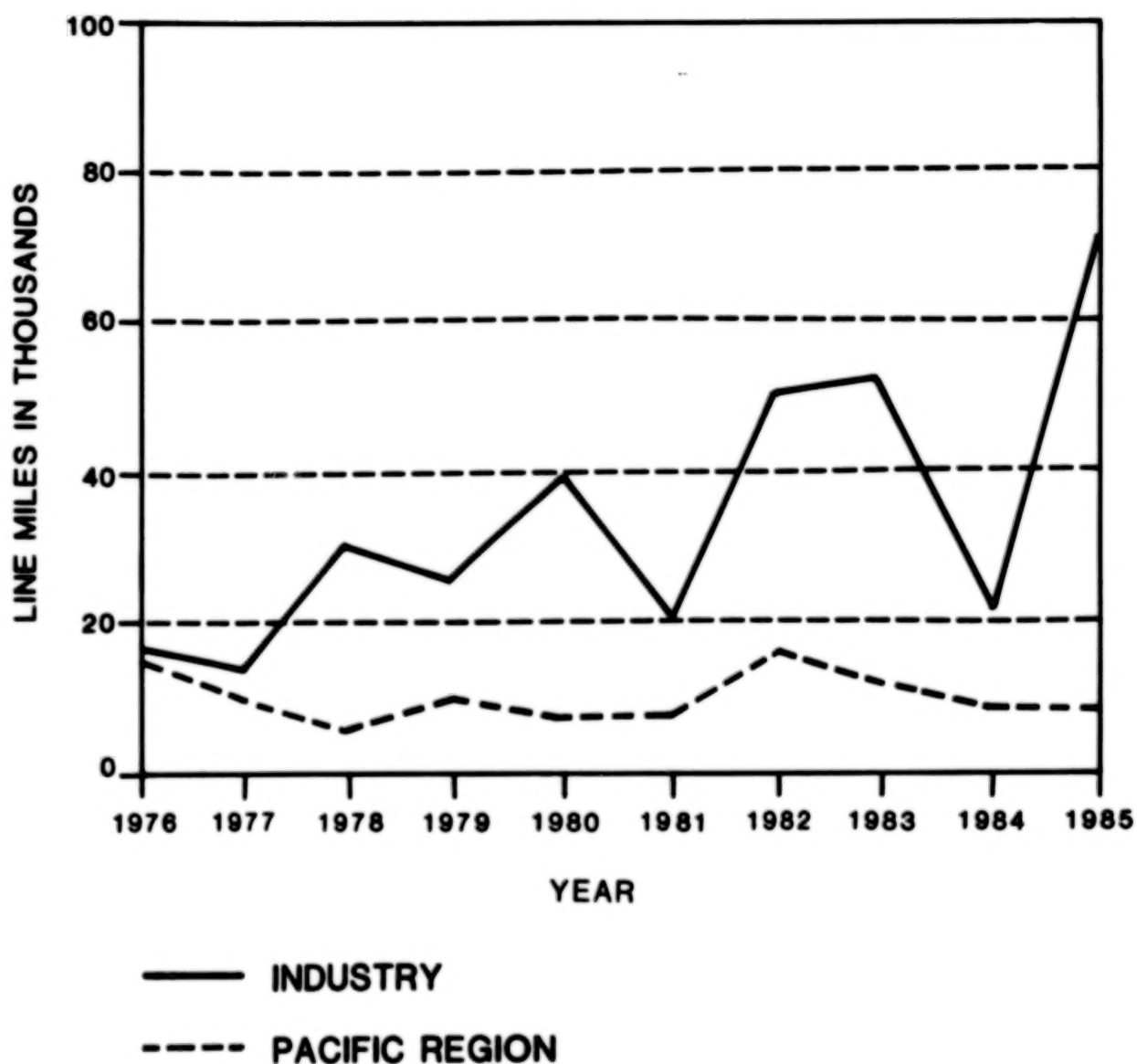


Figure 35A.--Comparison of miles of seismic data acquisition for Pacific Region and industry by year, 1976-1985



Figure 36A.--Comparison of expenditures for seismic data acquisition for Pacific Region and industry by year, 1976-1985

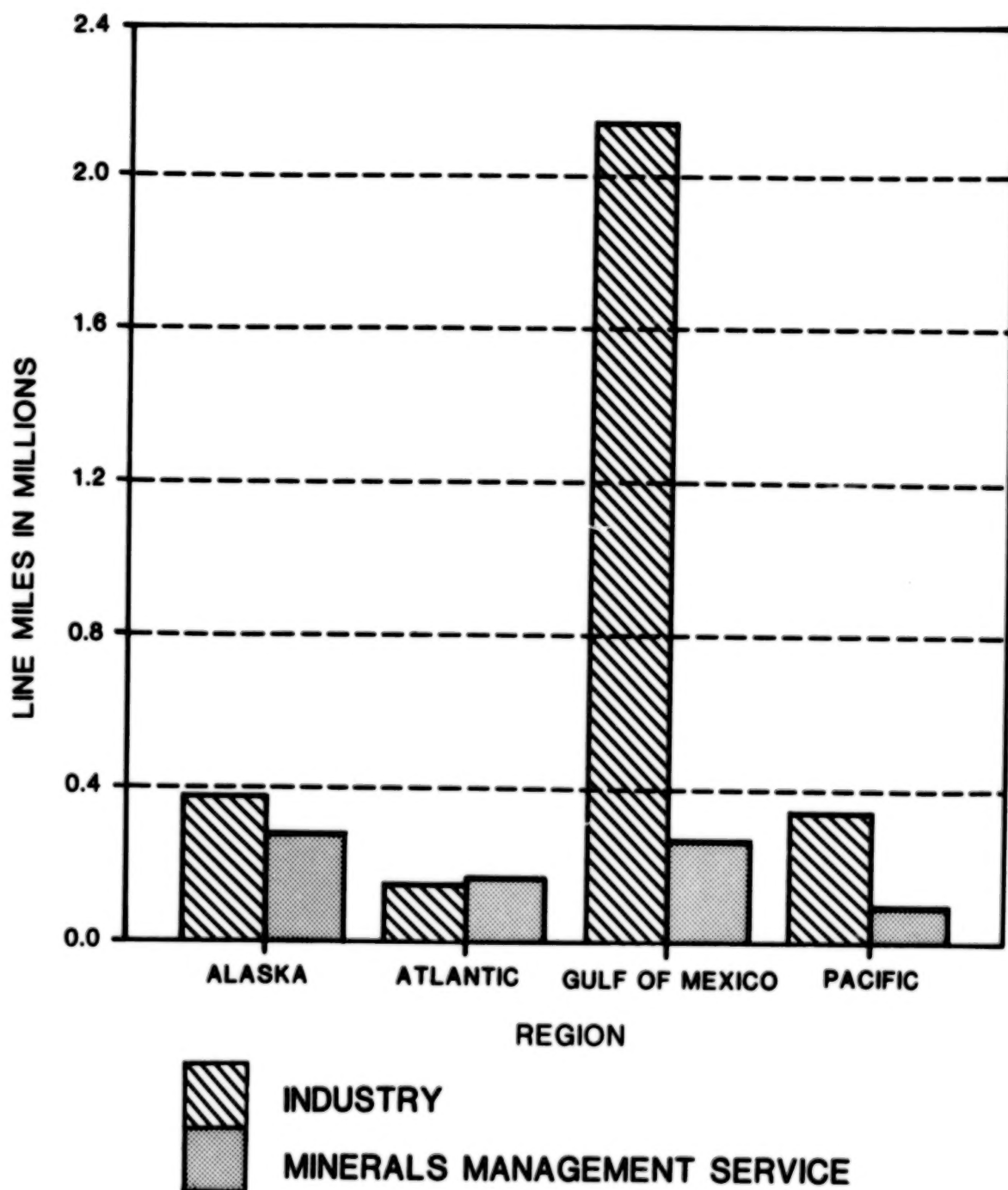


Figure 37A.--Comparison of total miles of seismic data acquisition for MMS and industry by region, 1976-1985

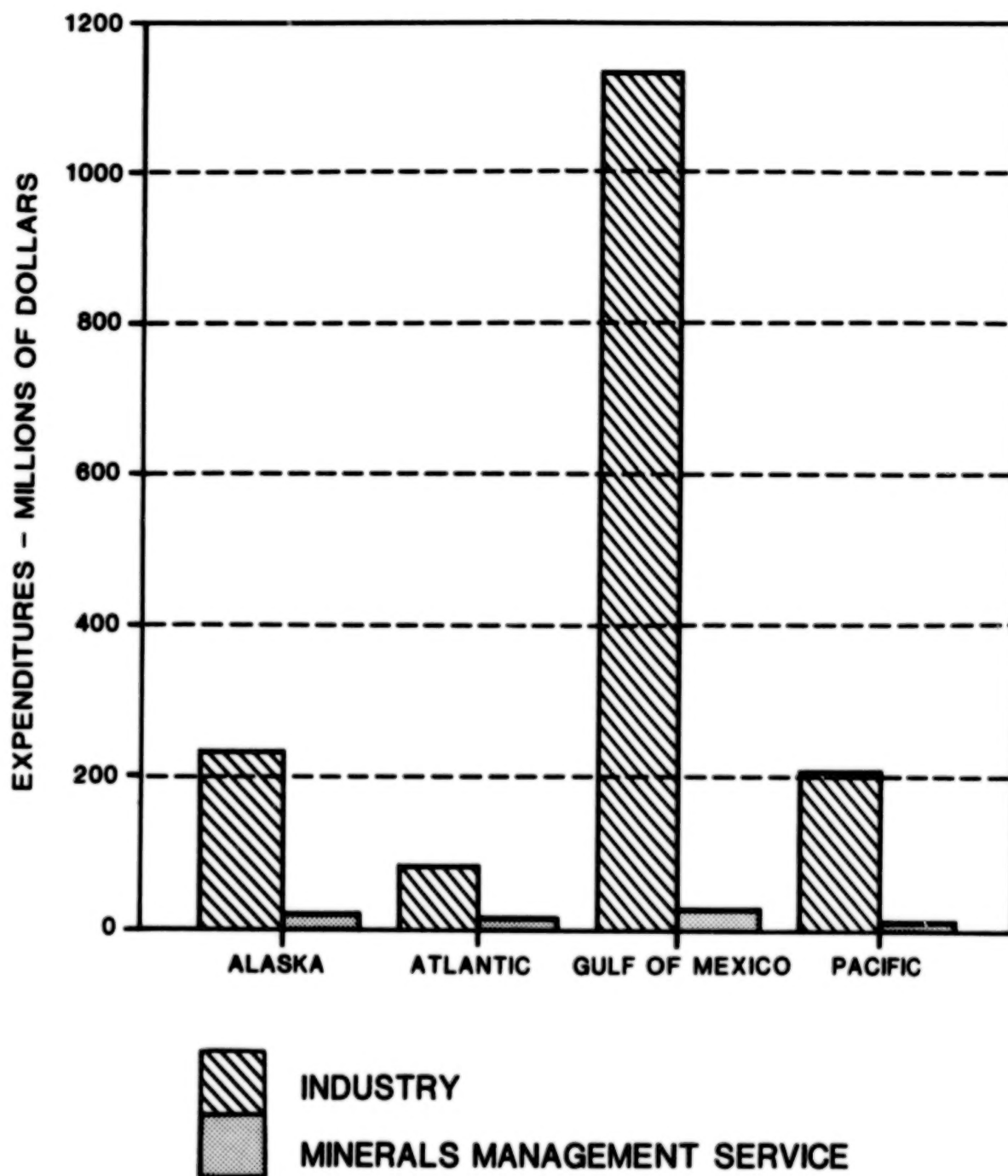


Figure 38A.--Comparison of total expenditures for seismic data acquisition for MMS and industry, 1976-1986

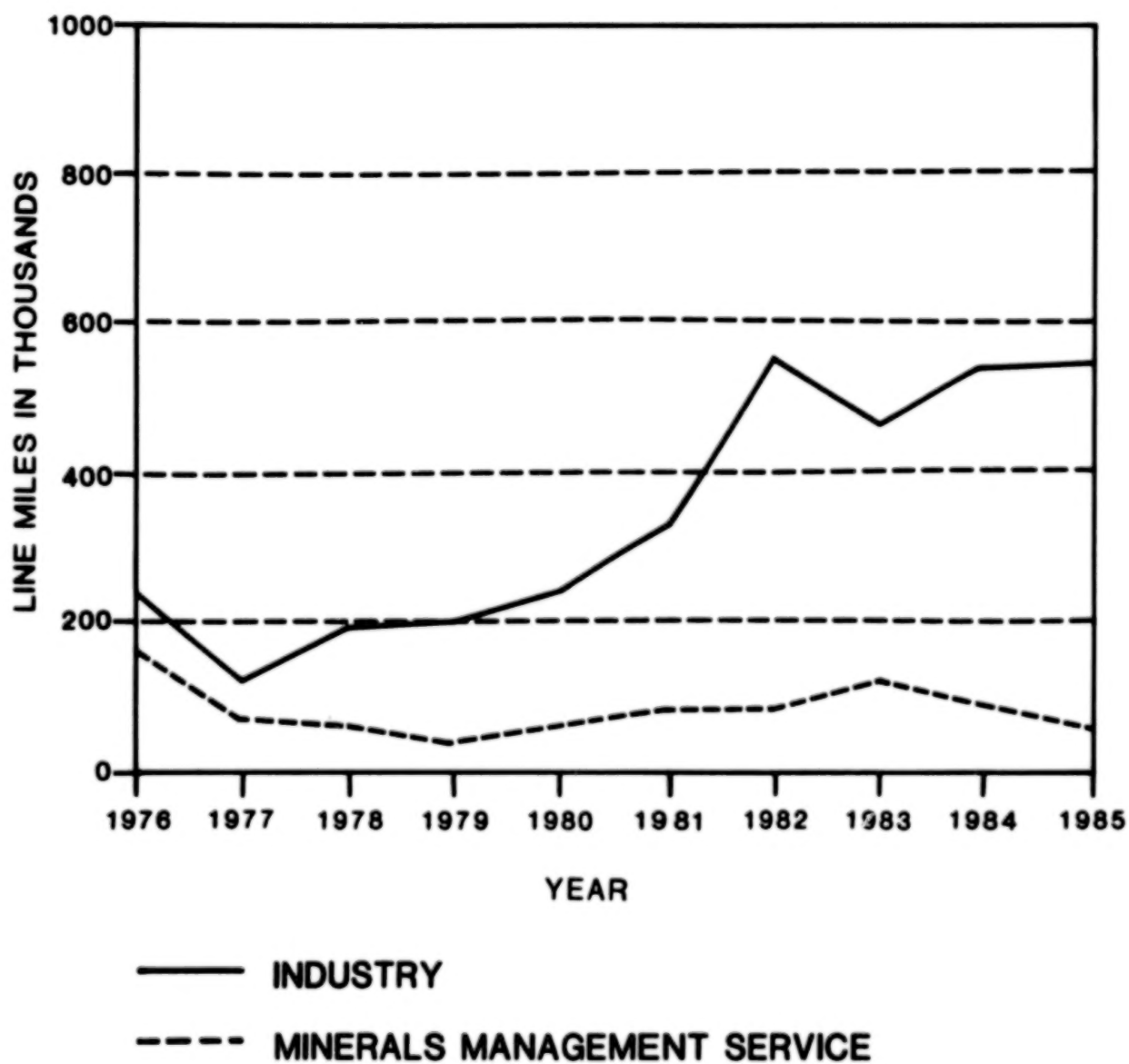


Figure 39A.--Comparison of total miles of seismic data acquisition for MMS and industry by year, 1976-1985

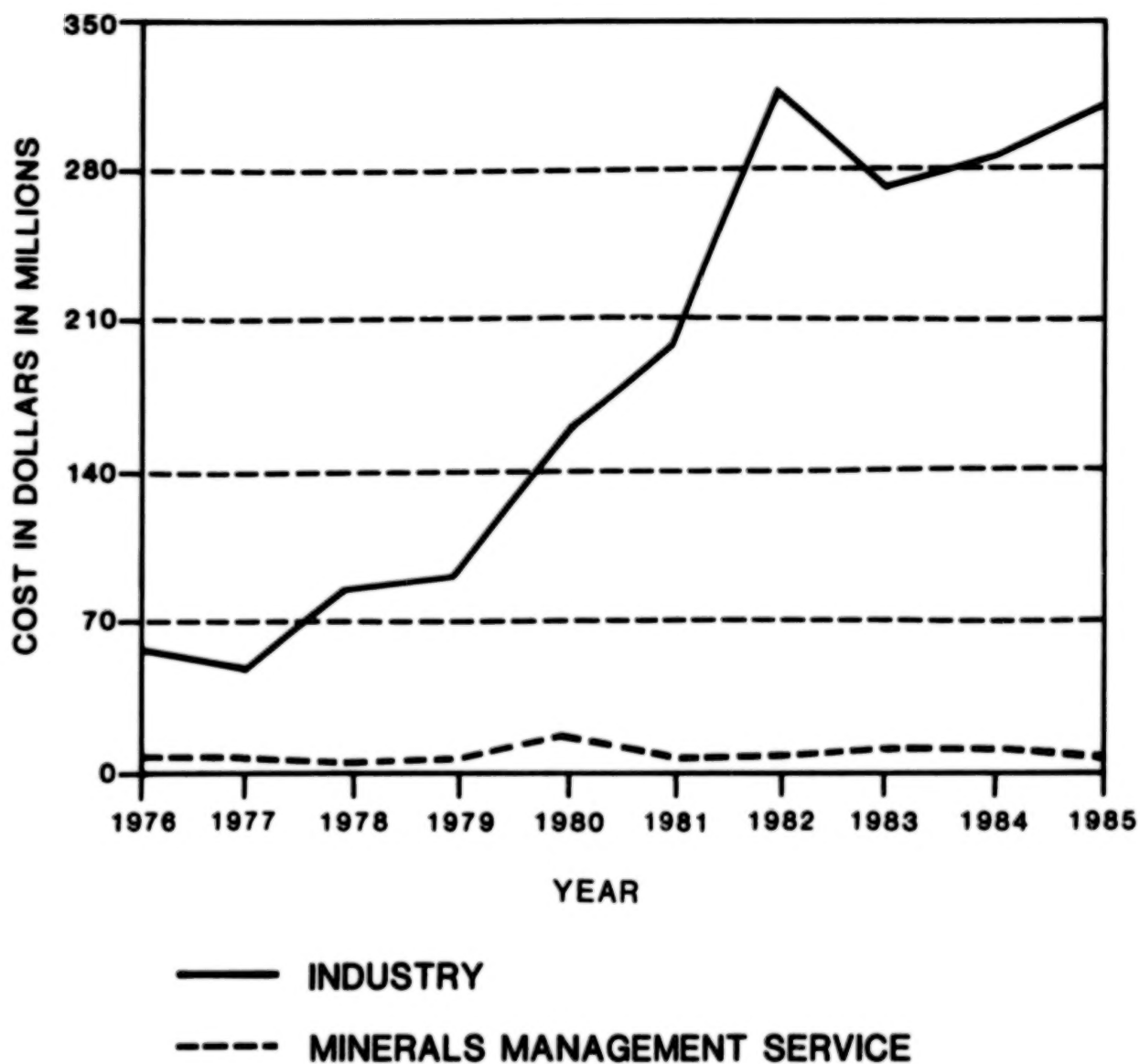


Figure 40A.--Comparison of total expenditures for seismic data acquisition for MMS and industry by year, 1976-1985

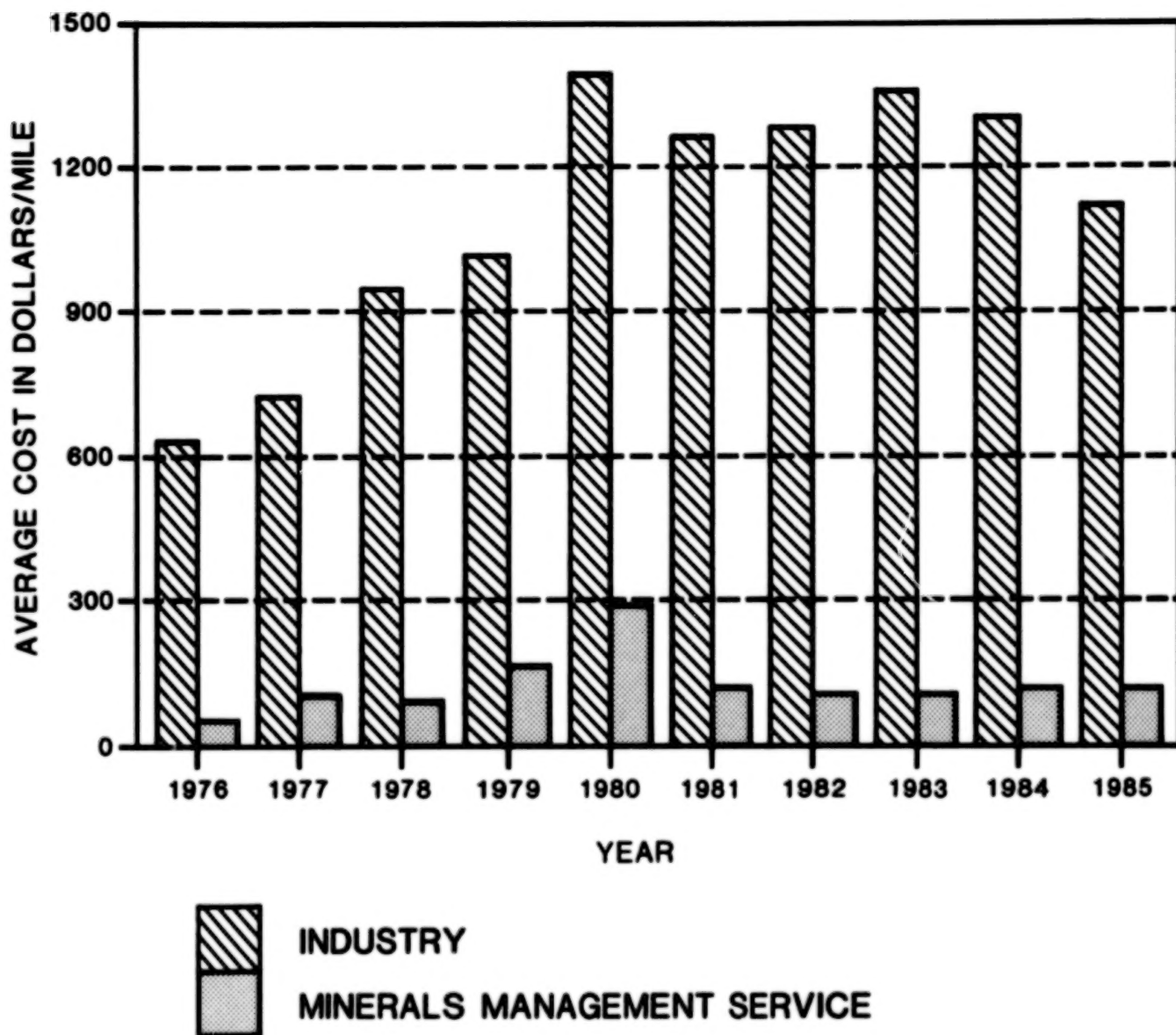


Figure 41A.--Comparison of average cost per mile of seismic data acquisition for MMS and industry by year, 1976-1985

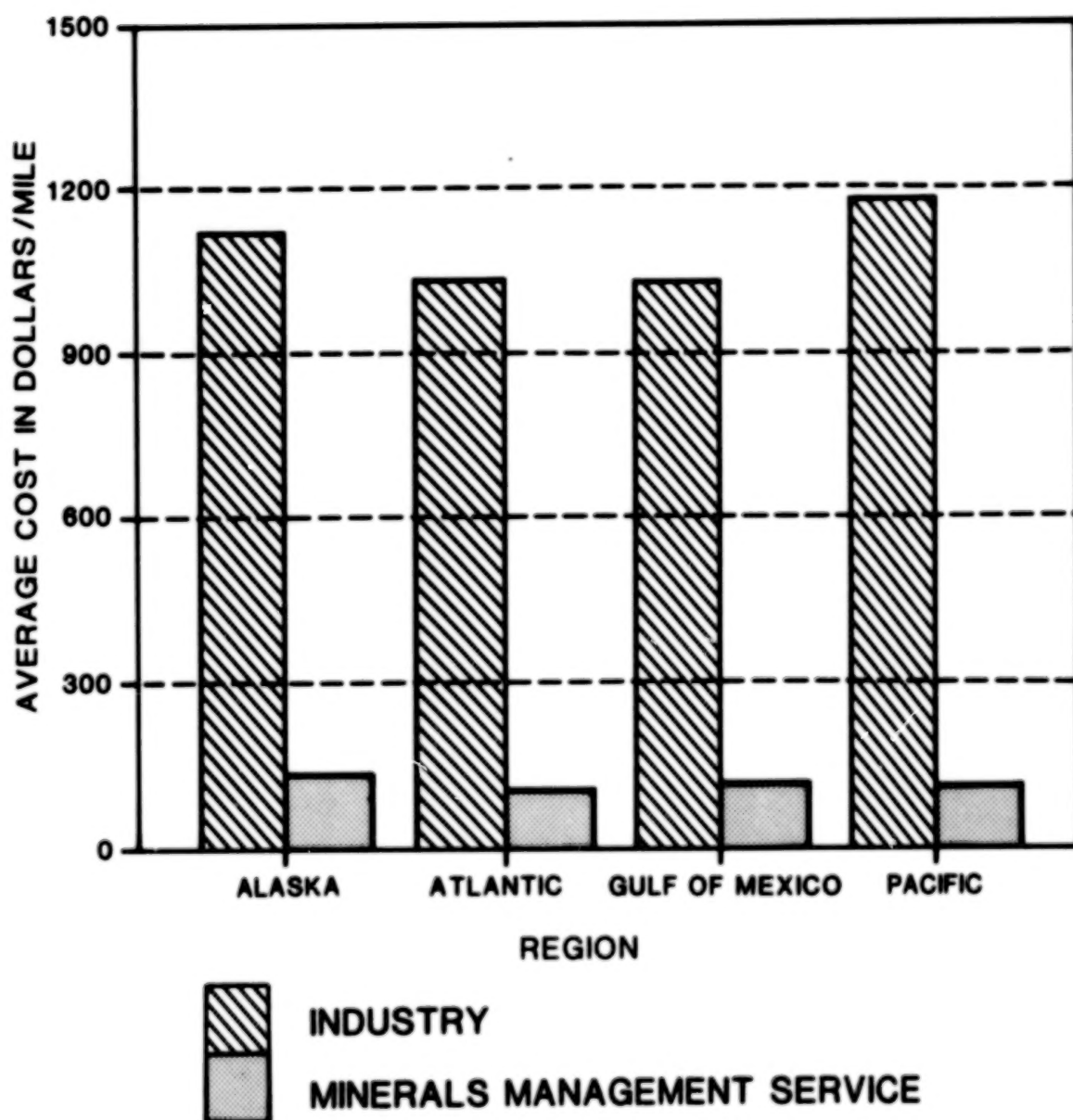


Figure 42A.--Comparison of average cost per mile of seismic data acquisition for MMS and industry by region, 1976-1985

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GLOSSARY

Area of Hydrocarbon Potential - that part of a planning area which has the primary geologic characteristics favorable for the generation and the accumulation of hydrocarbons.

Block - a geographically defined section of the Outer Continental Shelf (OCS), which is designated by a number on Official Protraction Diagram or Leasing Map prepared by the Minerals Management Service. A block normally is a 9-square-mile area (3 miles x 3 miles) consisting of 5,760 acres. A single block is the smallest unit which can be leased for oil and gas exploration on the Outer Continental Shelf.

Call for Information and Nominations - the first formal step in the sale process, the Call is a notice published in the Federal Register. It informs the public of the potential areas under consideration for oil and gas leasing and solicits comments from States and all interested parties on areas which should receive special attention and analysis. The Call includes a map defining that part of the planning area most favorable for the operation and accumulation of hydrocarbons ("area of hydrocarbon potential.")

Check Shot Survey - a survey in which a geophone lowered into a well bore records seismic waves (shots) that originate from above the seafloor, usually at the surface, or from a nearby well bore. Results of velocity and sonic logs are checked in this kind of survey.

Common Depth Point - a common location in the ocean subbottom where sound waves originating from various positions of the seismic (sound) source near the ocean surface are reflected back toward the surface. The traces from different seismic profiles corresponding to the same reflection point are mathematically summed (stacked) for reflection points beneath the survey line. Also known as common mid-point or common reflection point.

COST Wells - Continental Offshore Stratigraphic Test Wells - deep stratigraphic wells drilled to determine the geological character or stratigraphy of rock strata. These wells, which may be more than 20,000 feet deep, provide information that can be used by Government and industry to evaluate tracts to be offered in a lease sale.

Fair Market Value - the amount in cash, or on terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable purchaser who desired, but is not obligated, to buy. This market value which is sought is not merely theoretical or hypothetical but it represents, insofar as it is possible to estimate it, the actual selling price.

High-Resolution - a range of seismic frequencies above the normal range of frequencies used in exploration with an improvement in resolution in the shallow portions of the subbottom but with less total penetration into the subbottom.

Lease - any form of authorization which is issued under section 8 or maintained under section 6 of the Outer Continental Shelf Lands Act and which authorizes exploration for and development and production of minerals or the area covered by that authorization, whichever is required of the context.

Lease Sale - An MMS proceeding by which leases for certain OCS tracts are offered for sale by competitive bidding and during which bids are received, publicly announced, and recorded.

Minimum Economic Field Size - the amount of resources for a prospect that would give that prospect a positive resource economic value.

Outer Continental Shelf - All submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in section 2 of the Submerged Lands Act and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control.

Outer Continental Shelf Lands Act - law passed by Congress on August 7, 1953, and amended in 1975, 1978, and 1985.

Permit - the contract or agreement, other than a lease, approved for a specified period of not more than 1 year under which a person acquires the right to conduct (1) geological exploration for mineral resources, (2) geophysical exploration for mineral resources, (3) geological scientific research, or (4) geophysical scientific research.

Shallow Hazards - potential geological and manmade hazards to exploration on the OCS which are in the shallow portion of the subbottom. Examples include seismicity, active faults, shallow gas deposits, steep slopes, unstable soil conditions, pipelines, anchors, and sunken ships. Shallow hazards may occur in shallow or deep waters.

Undiscovered Economically Recoverable Resources - potential commercial accumulations of resources outside of known fields estimated from geological, engineering, and economic inferences.

Vertical Seismic Profiling - measuring the response of a geophone at various depths in a borehole to seismic sources on the surface. Seismic profiles of rocks adjacent to and below the well are obtained this way.



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